

MARINE REVIEW

Entered at Cleveland Post Office as Second-class Mail Matter.

VOL. XXVI.

Published every Thursday at
39-41 Wade Bldg., by the
Marine Review Pub. Co.

CLEVELAND, O., AUGUST 7, 1902.

Subscription \$3.00 a year.
Foreign \$4.50 a year.
Single Copy 10 cents.

No. 6

MARINE REVIEW AND MARINE RECORD CONSOLIDATED.

With its next issue the Marine Review will appear in conjunction with the Marine Record. The papers have been consolidated and will hereafter appear as one. The Marine Record is the oldest publication of its kind on the great lakes, having been established in 1878 and having appeared continuously since. The Marine Review was established in 1890. The immediate effect of the consolidation of these two properties will be the publication of a greater and more satisfactory marine paper than ever. The title of the consolidated publication will be Marine Review and Marine Record and it will be issued from the present offices of the Marine Review Publishing Co., 39-41 Wade building, Cleveland. Every feature of interest and value in the Record will be continued in the combined publication. No one who has been a subscriber to or an advertiser in the Record will have cause to regret the discontinuance of the paper as a separate enterprise. Especial care will be taken to see that he is pleased by the amplification of every department which he has hitherto enjoyed in the Record; and by the introduction of a variety of features which have been the especial province of the Review; in other words, there will be no jot or tittle less to please, but an hundred reasons why his favor should be strengthened. All this will be borne home to him by an inspection of the initial issue of the merged publication. He will find the journal printed upon a better quality of paper than ever, the types new, the articles timely and the illustrations as perfect as plates can make them. He will also find it more than twice as big as the publication he has been accustomed to. Nor need the subscribers and advertisers of the Review have any misgivings. The character of the Review will have expanded in the merger, but will not have changed. Reliability of statement, accuracy of information will, as ever, be its watchword.

The consolidation of these two properties has been upon the advice of the friends of both. Each paper was practically covering the same field on the great lakes, a field so compact that it seemed idle to attempt to divide so limited a territory and which could be more satisfactorily covered for both interests in one publication. Therefore the consolidation was agreed upon—a reflection of the economy of the time which seeks to produce the best product at the lowest cost. This is, indeed, the only principle upon which a combination of interests can ever hope to live and it is the principle to which the Marine Review and Marine Record pledges itself. The paper will be bigger and better than ever. It will enter upon its merged life with a wider influence and a greater circulation and will undoubtedly be able to render its patrons a more potent service. It will be the only publication of its kind of any importance west of New York and the only one of its kind whatever on the great lakes.

It would be a mistake, however, to suppose that the energies of the Marine Review and Marine Record will be confined to the great lakes. The great lakes will only be a department, a great one to be sure; but its real field will be the maritime industry of the United States.

SURPASSING ALL RECORDS IN IRON ORE OUTPUT.

Conservative estimates regarding the season's output of iron ore from mines of the Lake Superior region place the total at 23,000,000 gross tons. This is the total given out by the ore shippers, who are usually inclined to be somewhat under rather than over the mark. It would not therefore be surprising if the aggregate is 24,000,000 tons. This is certainly an enormous amount of iron ore. Twenty-four millions in gross tons means nearly twenty-seven millions in net tons.

Complete returns from the upper lake shipping ports dealing with the output to August 1 show a total to that date of 12,973,219 tons, as against 8,661,431 tons on the same date a year ago, which is a gain of 4,311,788 tons, or 49.79 per cent. Of course this great increase is largely due to the earlier opening of navigation this year, and it is not expected that there will be any material increase for the balance of the season. In fact, it will not be at all surprising if there is a material falling off, compared with last year, for the balance of the season. Still the July output was very much larger than the output of July, 1901. For the first time in the history of the industry an output of more than 4,000,000 tons was attained in a single month. The exact figures are 4,073,386 tons for July of this year, compared with 3,697,823 tons in July, 1901, a gain in 1902 of 375,563 tons, or 10.15 per cent.

Scarcity of pig iron throughout the country has reached a stage that indicates the importation very shortly of large quantities of iron for foundry purposes. Foundry iron is now being sold for delivery as late as September of next year. Imports of pig iron for purposes other than foundry use have, of course, been going on for some time past. In the first six months of this year these imports amounted to 115,607.

Mr. Henry Steinbrenner of Cleveland, representing Minch vessel interests, has just ordered from the American Ship Building Co. a steel freight steamer of 380 ft. keel length by 50 by 28 ft.; engines 22, 35 and 58 by 40 in.; three 12 by 12 ft. boilers, natural draft; to be built at the Globe yard, Cleveland.

THIRTY-FIVE MILLIONS TO AND FROM LAKE SUPERIOR.

More freight is now moved to and from Lake Superior through the canals at the Sault in a single month than was moved in a full season fifteen or eighteen years ago. It is now quite probable that the commerce of the canals for the present season will aggregate 35,000,000 tons. The total to Aug. 1 is 16,568,889 tons, against 11,548,192 tons on the same date a year ago, or a gain thus far this season of 5,020,707 tons. All monthly records were broken in July when the freight tonnage exceeded five millions. The exact figures were 5,082,398 tons. A detailed summary of the combined traffic of Canadian and United States canals to August 1 of this year compared with Aug. 1, 1901 and 1900, follows:

MOVEMENT OF PRINCIPAL ITEMS OF FREIGHT TO AND FROM LAKE SUPERIOR.

ITEMS.	To Aug. 1, 1902.	To Aug. 1, 1901.	To Aug. 1, 1900.
Coal, anthracite, net tons.....	105,228	274,698	317,363
Coal, bituminous, net tons.....	2,197,418	1,640,096	2,111,187
Iron ore, net tons.....	11,594,239	7,685,808	8,258,822
Wheat, bushels.....	28,937,384	13,595,296	23,865,065
Flour, barrels.....	3,607,437	2,969,966	2,559,913

REPORT OF FREIGHT AND PASSENGER TRAFFIC TO AND FROM LAKE SUPERIOR, FROM OPENING OF NAVIGATION TO AUGUST 1 OF EACH YEAR FOR THREE YEARS PAST.

EAST BOUND.

ITEMS.	Designation.	To Aug. 1, 1902.	To Aug. 1, 1901.	To Aug. 1, 1900.
Copper	Net tons....	54,362	38,508	59,801
Grain, other than wheat	Bushels....	4,066,108	6,120,510	5,160,238
Building stone	Net tons....	20,081	15,280	10,616
Flour	Barrels.....	3,607,437	2,969,786	2,559,751
Iron ore	Net tons....	11,594,239	7,685,808	8,258,822
Iron, pig	Net tons....	7,396	16,759	10,163
Lumber	M. ft. b. m.	495,551	431,616	368,069
Silver ore.....	Net tons....			
Wheat	Bushels....	28,937,384	13,595,296	23,865,065
Unclassified freight	Net tons....	46,870	16,745	22,946
Passengers.....	Number....	15,117	13,301	11,704

WEST BOUND.

Coal, anthracite.....	Net tons...	105,228	274,698	317,363
Coal, bituminous.....	Net tons...	2,197,418	1,640,096	2,111,187
Flour	Barrels		180	162
Grain	Bushels....	60	52,330	5,584
Manufactured iron.....	Net tons...	64,864	43,428	64,933
Salt	Barrels	251,021	216,659	101,193
Unclassified freight.....	Net tons...	277,380	205,727	196,619
Passengers.....	Number ...	15,726	14,859	12,386

SUMMARY OF TOTAL FREIGHT MOVEMENT IN TONS.

	To Aug. 1, 1902.	To Aug. 1, 1901.	To Aug. 1, 1900.
East bound freight of all kinds, net tons.....	13,886,984	9,350,923	10,069,802
West bound freight of all kinds, net tons.....	2,681,915	2,197,269	2,705,444
	16,568,899	11,548,192	12,775,246

Total number of vessel passages to Aug. 1, 1902, was 11,029, and the registered tonnage 15,003,729.

A board of inspection from the navy department is now touring the great lakes with a view of selecting the naval training station provided for recently by congress. There is much competition among the cities of the great lakes for the honor of this station. A number of contestants have no claim whatever for the station, and among those which have not, in our judgment, is Cleveland. There are a great many harbors along the great lakes which are superior to Cleveland for naval training purposes. Cleveland has no natural harbor whatever. It has a harbor made by breakwater for purely commercial reasons but there are several harbors along the lakes which are natural and which are admirably adapted for naval training purposes. The foremost of these we should say is the harbor of Erie. A question of this sort which concerns the country in general should be looked at broadly. One cannot blame a town for contesting for the place, but nevertheless mere local considerations should not obtain. What is said of Cleveland may also be said, of course, of such places as Chicago and Buffalo.

NEW TIME FUSE FOR ARMOR-PIERCING SHELLS.

A Washington dispatch announces that what is regarded by ordnance experts of the army and navy as the most important advance in modern war devices since the perfection of the Krupp face-hardening process of armor has been achieved by the ordnance department of the army under the direction of its chief, Brig. Gen. William Crozier. It is a new time fuse for armor-piercing shells. The importance of this time fuse lies in the fact that it does not detonate the shell until the penetrative ability of the shell has been exhausted. Its great value to the United States will be understood when it is explained that with a shell equipped with this fuse and loaded with the powerful secret explosive discovered by the ordnance experts, fired from a 12-in. gun, a penetration of 14 in. of Krupp armor has been secured before detonation. The heaviest Krupp armor used in any battleship in the world is only 12 in. thick. Heretofore it has been regarded as absolute protection against the best shell and the most powerful rifle in existence. The naval authorities have been informed of the achievement of the army ordnance officers, and they are intensely concerned over the matter, as the success of the tests demonstrates that it is possible to fire a projectile which can penetrate thicker Krupp armor than protects the sides of any American battleship. It has not been shown, however, that the results achieved by the army can be duplicated with navy ordnance. The army 12-in. rifle, with which the tests were made, is heavier than the navy 12-in. rifle, and is not regarded as suitable for use on shipboard, but to the minds of the military authorities it is clear that there is not an armor clad in any foreign navy that has armor tough enough to withstand complete penetration by the 12-in. shell filled with the new high explosive and detonated by the new fuse fired from an army rifle.

Ever since modern armor and modern ordnance have been in use ordnance experts all over the world have been trying to devise a fuse that would not detonate the shell until the limit of penetration had been reached. The great difficulty to be overcome lay in the tendency of the tremendous impact of shell and armored target to detonate the projectile through improper functioning of the fuse. Success in this regard would mean that with a rifle giving complete penetration the shell would be exploded on the inside of the vessel struck inflicting damage many fold greater than if it exploded on the outside of the armor. The ordnance officers of both the army and the navy have been devoting much time to the study of this important matter and it is now practically certain that the army experts have overcome the difficulty. Their ultimate triumph has been due largely to the marvelous results achieved with the new high explosive. They found that a small quantity of this was of greater strength than a large quantity of any other high explosive. One difficulty that has been encountered in the use of explosives in armor-piercing shell was that so great a quantity was required that it was necessary to make the walls of the shell so thin that they could not withstand the effect of impact with modern armor. It was found, however, that equal or greater results were achieved with thick-walled shells loaded with the necessarily smaller quantity of the new army explosive. With the new fuse, which is not exploded by the force of impact, these thick-walled shells were not exploded until they had reached the limit of their penetration and then the fragments of shell were driven forward.

Heretofore a common 12-in. armor-piercing shell has been unable to penetrate more than 7 in. of Krupp armor. It has been found that these shells, loaded with the army high explosive detonated by the new fuse, have been able to penetrate 12 in. of Krupp armor. No known 12-in. shell loaded with any other high explosive has been able to penetrate 12 in. of armor hardened by the Krupp process. Actual tests made by the army ordnance department have demonstrated that 14 in. of Krupp armor can be penetrated with projectiles containing the new explosive and the latest fuse. Of course, the properties and arrangement of the fuse are as great a secret as the formula of the high explosive. The fuse has a time arrangement by which the actual moment of detonation is governed. It is said to have worked perfectly, not exploding the shell charge until the time fixed had expired.

NEW PROCESS OF HARDENING ARMOR.

What seems to be another and most gratifying advance step towards perfection in modern war devices has been taken through the efforts of an American officer. A story from Washington is to the effect that the Krupp process of hardening armor, regarded generally as giving the greatest resisting power to the protective plates of war vessels, has been outstripped in effectiveness, it is believed, by a process of American invention that may overcome the wonderful penetrative ability secured by the soft nosed armor-piercing shell fitted with the delayed action fuse. Its discoverer or inventor is Lieut. Cleland Davis of the navy, an accomplished and brilliant officer who has devoted himself to ordnance work and is now attached to the naval bureau of ordnance. He was a member of the board which made the record breaking tests at the Sandy Hook proving ground last November when, with an army 12-in. coast defence gun, an armor plate treated by the Krupp process was entirely penetrated. Since then, like his associates in ordnance work, he has been employing his knowledge of face hardening process in an effort to secure an improvement in the Krupp method. His plan contemplated the use of heavy currents of electricity, directed upon the armor plate while in a heated condition by large carbon anodes, similar to the candle of an arc light, but many fold greater in size. Lieut. Davis, in his experiments, discovered that a current of electricity sent through such a carbon and into the surface of a plate, carried with it bodily a portion of the carbon and transferred it into the body of metal. The spot so treated became intensely hard—harder, it is said, than any face-hardening process can make it. The depth of the hardening is dependent upon the length of time the current is applied to any particular spot, thus overcoming the difficulty of hardening for a limited distance only. Extraordinary results in the matter of time saving, which means greater economy in plate making, have been secured by Lieut. Davis. The ordinary Harvey or Krupp plate is kept "soaking" at a red heat for from two to three weeks before it becomes sufficiently impregnated with carbon. Lieut. Davis has reported the same result in five hours.

The Bethlehem Steel Co. has made a ballistic test of a 5-in. plate produced at their plant, and the outcome is regarded as sufficiently satisfactory to warrant the development of the process. The only fault to be found in this experimental plate was that it was irregular in its hard-

ness, but this was accounted for by the experimental character of the electrical appliances used, and the Bethlehem company is now constructing another set involving the use of carbon rollers instead of candles, which, it is expected, will yield absolutely uniform hardness. The apparently certain result is that American armor plate under this process will be produced at a figure far below that at which production is possible in any other country. Lieut. Davis' estimate is that he can save from 20 to 50 per cent. in the weight of a plate giving resistance equal to a Krupp plate. If this fact is established it will become possible to do one of three things:

First, to increase by that percentage the armor defensive power of a warship; second, to apply the saving of weight to armor, keeping the weight of the defensive power the same, or to the increase of the battery power; or, third, to increase the coaling capacity and consequently the steaming radius of a ship by a large percentage.

Rear Admiral Charles O'Neil, chief of the naval bureau of ordnance, who is noted for his conservatism and caution concerning new war devices, said that he regarded Lieut. Davis' invention as promising. He was watching its development with deep interest. In regard to the test of the 5-in. plate treated by Lieut. Davis' method, he said that in his opinion the process was not at fault. The trouble, he believed, was an imperfect treatment. Lieut. Davis served on the Helena in the West Indies in the war with Spain, and later in the Philippines, during the active period of the insurrection. He was advanced ten numbers in his grade for gallantry while commanding a naval machine gun landed from the Helena in Gen. MacArthur's campaign against Aguinaldo's capitol.

EXPORTS OF MANUFACTURE.

It is now possible to determine accurately the movements of manufactures and manufacturers' materials in the foreign commerce of the United States during the fiscal year 1902. The June report of the treasury bureau of statistics, showing the imports and exports by articles for the month of June and for the entire year compared with preceding years, has just been completed and given to the public. It shows that the total exports of manufactures are \$403,890,763, against \$412,155,066 in 1901, a reduction of \$8,264,303. In iron and steel manufactures alone the exports have fallen from \$117,319,320 in 1901 to \$98,552,562, a reduction of \$18,766,758. Thus the decrease in iron and steel manufactures alone is \$10,000,000 greater than the total reduction in exports of manufactures, indicating that in other articles there has been a net increase. Taking the general class of manufactures exported, it may be said that a majority show an increase in 1902 compared with 1901, while some of the articles showing a decrease in value of exports show an increase in quantity, indicating that the reduction is due in some cases to reduced prices and not to reduced exports. In copper, for example, the exportation of ingots, bars, plates, etc., amounted in the fiscal year 1902 to 288,720,655 lbs., against 252,769,328 lbs. in the preceding year, an increase of 35,951,329 lbs.; while the value was in 1902, \$39,190,619, against \$41,260,376 in 1901, a reduction of \$2,069,757.

The following table, prepared by the treasury bureau of statistics, shows the exports of the principal manufactures, and includes all articles or groups of articles, the exports of which in 1902 exceeded \$1,000,000. The figures for 1902 are compared with those for 1901, and thus present in concise form an analysis of the export trade in manufactures in 1902 compared with 1901:

Articles.	1901.	1902.
Iron and steel mfrs	\$117,319,320	\$98,552,562
Mineral oils, refined	63,049,812	65,842,826
Copper mfrs.	43,267,021	41,218,373
Cotton cloth	14,136,037	25,861,196
Leather	21,320,646	22,350,134
Agricultural implements	16,313,434	16,286,740
Chemicals, etc.	14,384,453	13,288,218
Wood mfrs.	11,099,643	11,617,690
Paraffin	6,857,288	8,858,844
Leather mfrs.	6,603,007	7,448,189
Paper and mfrs.	7,438,901	7,312,030
Cars and carriages	8,405,127	7,244,944
Other cotton mfrs., except cloth...	6,136,381	6,247,166
Tobacco mfrs.	5,092,603	5,668,853
Scientific instruments	7,361,231	5,389,476
Fiber mfrs.	4,302,876	4,575,219
Books, maps, etc.	3,472,343	3,997,977
Musical instruments	2,780,796	3,694,143
India rubber mfrs.	3,017,268	3,462,402
Spirits	3,054,723	3,011,894
Bicycles	2,515,804	2,627,572
Clocks and watches	2,340,751	2,144,490
Paints and colors	2,036,343	2,096,379
Gunpowder and explosives	1,712,102	2,062,381
Glass and glassware	2,126,309	1,960,106
Brass and mfrs.	2,007,450	1,930,810
Marble and stone mfrs.	1,638,314	1,761,696
Soap	1,569,180	1,630,938
Wool mfrs.	1,542,733	1,512,457
Jewelry, etc.	1,229,672	1,338,847
Malt liquors	1,723,025	1,290,062
Other articles	26,300,473	22,106,649
Total exports of manufactures..	\$412,155,066	\$403,890,763

Trials of the new Russian cruiser Bogatyr, built by the Vulcan company at Settin, Germany, have just been completed. On a twelve hours' trial she maintained a mean speed of 24.15 knots. The mean power developed was 20,250 I.H.P. Her displacement is 6,750 tons. She is 416 ft. 8 in. long on the water line; 54 ft. 6 in. beam; and has a draught of 20 ft. 10 in. Normand boilers are fitted, and these were worked under a pressure of $\frac{5}{8}$ in. on the trials. For protecting the hull there is a 2 $\frac{3}{4}$ -in. curved deck, and only some of the twelve 6-in. quick-firing guns have 5-in. armored hoods and armored ammunition hoists; the others are practically without protection. In addition there are a dozen 3-in. guns and six Hotchkiss weapons, so that in offensive power she is very strong, and, with her great speed, is an effective ship. She carried 720 tons of coal on the trial displacement, but stowage has been provided for 400 tons more.

UPHELD THE LOCAL INSPECTORS.

Mr. John D. Sloane of Dubuque, Iowa, supervising inspector of steam vessels for the fifth district, which takes in the head of Lake Superior, has upheld the decision of the local inspectors at Duluth who recently revoked the license of Capt. Michael Fitzgerald of the steamer G. G. Hadley. His letter on the subject to the Duluth inspectors, Messrs. Monaghan and Chalk, is dated August 2, and is as follows:

"In the matter of the revocation by you of the license of Capt. Michael Fitzgerald, June 12, 1902, for violation of the rules governing navigation of the great lakes, while in command of steamer George G. Hadley on June 7, 1902, resulting in a collision between said steamer and steamer Thomas Wilson on Lake Superior in the vicinity of Duluth piers, sinking the latter steamer and drowning nine of the crew, I wish to advise you that in accordance with his appeal from your decision, dated June 20, 1902, I granted Capt. Michael Fitzgerald a hearing at Dubuque, Iowa, Aug. 1, 1902, at which time Capt. Fitzgerald's evidence was taken, in addition to arguments presented by Mr. C. E. Kremer of Chicago, Capt. Fitzgerald's attorney, why your decision should not be sustained. After carefully reviewing the evidence taken before you, in addition to testimony given by Capt. Fitzgerald before me, and giving due consideration to the argument presented by Mr. Kremer in Capt. Fitzgerald's behalf, I am of the opinion

large, and I think it is only when the workers of this country fully realize the importance of their individual work and the folly of neglecting it for the passing, and often dangerous, excitements of the moment, that we can hope to hold our own with other nations, who are determined to occupy our place in the industrial world. I am, therefore, in my personal capacity, arranging to give special facilities to the many thousands who are connected with me in the work of my many undertakings, and who, while desiring to apply for some of these ordinary shares, may feel that they are not momentarily prepared for such an outlay. I am ready to advance to them, at the rate of $3\frac{1}{2}$ per cent. per annum, the amount they require to enable them to become shareholders, and in order to facilitate the applications, I wish all of them to be handed to the heads of the respective departments, and then forwarded to Mr. D. Cooke and Mr. Harry Furness, at the head office of this company, to be submitted to me, and from these applications allotments will be made by the directors. Accounts will be opened, crediting them with the dividends, which it is proposed to pay quarterly at the rate of 10 per cent. per annum, and which would yield, even though no bonus was declared, a very good interest on the issue price. I hope that the result of this new departure will be found mutually satisfactory."

In conclusion, Sir Christopher Furness, alluding to the shipping com-



GENERAL VIEW OF SHIP OWNERS' DRY DOCK CO.'S WORKS, CHICAGO.

that the evidence submitted shows conclusively that the action of Capt. Fitzgerald in changing the course of steamer George G. Hadley, by star-boarding the wheel of said steamer when in close proximity to the approaching steamer Thomas Wilson, was the primary cause of the collision. I therefore sustain you in your decision, and have this day notified Michael Fitzgerald to that effect."

PROFITS OF A BRITISH SHIP YARD.

The annual report of Furness, Withy & Co., Ltd., West Hartlepool, England, has just been issued. It shows that the profits have increased from £140,715 in 1897 to £308,318 in 1902. The company has decided to increase its ordinary capital by £500,000 in £1 shares. Upon this point Sir Christopher Furness says:

"I am pleased to congratulate you on the successful results of the year's work, which shows a profit of £308,318 18s. 10d., and when we take into consideration the general depression we have every reason to be satisfied. As you will remember at our last meeting, I mentioned that the directors had decided to increase the ordinary share capital by £500,000 ordinary shares, but that it was not proposed to offer these to the public. Owing, however, to representations then made, I promised that the matter would receive the board's careful consideration, and having regard to the number of requests made by debenture and preference shareholders—who, I may say, number over 1,000—the board have now decided to offer the shares to the public. Although the directors have arranged to subscribe for the whole of the shares at a premium of 10s. per share, we have decided to make a public issue on the same terms on which the directors themselves had agreed to take them. In this connection, now that a public issue is to be made, I am desirous of giving all those who are associated with me in the work of the many industrial concerns over which I preside, an opportunity, if they so wish, to become shareholders in this, my original, company, thus enabling them to have a direct interest in the financial results of their labors. I feel that were such a proposal more generally adopted, not only would the practical benefit be felt, but the results would have a direct, far-reaching, and, I hope, wholesome influence on the individuals. The interests of the employee, in whatever position he may occupy in the concern, would be more closely allied with those of the employer, than could possibly be the case where the employee merely represents the labor production without participating in the profits. Officials and workmen would generally realize that by assiduous attention to their particular department they would contribute, not only to their own prosperity, but indirectly to the prosperity of the nation at

bine, said: "I have been asked if I could say anything about the pending British shipping combine. I could say much, but do not consider it a fit and opportune time to enter into the general details of such a proposal."

WORKS OF SHIP OWNERS' DRY DOCK CO.

A general view of the Ship Owners' Dry Dock Co.'s works at Chicago appears on this page. Great improvements have certainly been made in this plant since it was known as the Miller Bros. dry docks. Repair work on a very large scale has been going on steadily since the large new dry dock was built. Some little trouble was experienced in getting the dock tight when it was built, but vessel men who have inspected it of late say it is now the driest dock on the lakes. Officials of the company give the credit on this score to Supt. W. W. Waterson, who has had a great deal of experience with lake dry docks.

Some delay has been encountered in getting material for the new Milwaukee fire boat, designed by Mr. W. J. Wood and to be built at the Ship Owners' works, but it is now expected that delivery of material will begin early enough to admit of the boat being finished on time.

The Chicago fire boat Geyser is being rebuilt at this yard.

What is said to be the largest crane in the world has recently been built for the Kaiser dock at Bremerhaven. The total weight of the crane, including counterbalance, is $474\frac{1}{2}$ tons. It consists of a four-legged tower supporting a revolving center post, to which is attached a horizontal jib, one arm of which carries a counterbalance at the extreme end, and the other arm a crab capable of traveling from its extreme end to the edge of the tower. It is capable of carrying a test load of 200 tons. The maximum pressure on the foundation imparted through the center pillar is about 520 tons, and the maximum horizontal force on the top of the tower about 98 tons. The total length of the jib is 164 ft., the height of gantry rails from the ground being 114 ft. 10 in. The crab contains the whole of the mechanism for lifting and traversing, the speed of the traverse being about 26 ft. per minute. The traveling mechanism is driven by a series motor, and the lifting mechanism by two motors.

The four-masted schooner Mary E. Wallace was successfully launched from the yards of Mather & Wood, Port Jefferson, L. I., last Saturday. Her dimensions are: Length over all, 214 ft.; length on water line, 185 ft.; beam, 40 ft. Fully 5,000 persons witnessed the launch.

INTERNATIONAL MARITIME CONGRESS.

A great variety of subjects connected with maritime trade were brought forward for discussion at the International Maritime Congress at Copenhagen. Eight states and about thirty corporate bodies were represented at the congress. The first subject on the agenda paper was "Meteorology and Earth Magnetism," on which a paper was read by M. Charles Benard, of the Ecole Centrale, Paris, setting forth the importance, for oversea navigation and the deep-sea fisheries, attaching to meteorological and oceanographical studies of the north Atlantic ocean, and recommending the appointment of an international commission for collating the results of these studies. The congress unanimously agreed with this suggestion. The abnormal deviations in the navigable channel near Bornholm, and other magnetic anomalies in Danish waters, were then dealt with by Mr. Adam Paulsen, director of the Danish Meteorological Institute, which deviations he ascribed partly to the unequal depth of those waters. No discussion arose on this paper. "Quarantine and other Sanitary Measures for Combating the Plague" was the next item on the list, and on this a long discussion arose, in which several delegates participated. It resulted in the adoption of a proposal put by M. Loir, member of the Pasteur institute, Paris, that an international conference should be held as soon as possible to discuss the proper measures to be taken. On the subject of "Deep-sea Fisheries," M. Henri Malo read a paper giving a history of deep-sea fishing from the middle ages downwards, and winding up with the proposal that fisher-folk in time of war should be considered neutral and not be subjected to hostilities on the part of belligerents, which proposal was agreed to by the congress. Capt. Drechsel, representing the Danish fishing interests, thereupon expatiated on the special importance to the fisheries of deep-sea exploration, and gave particulars of what had been done in that way since the Challenger expedition of 1873. M. Charles Benard dwelt on the damage not only to fishermen's nets, but to the flora and fauna of the sea on which fish depend for their subsistence, by the trawl-net, and suggested that international measures should be taken in the matter. The congress agreed with the suggestion. Another proposal adopted was that an international conference was urgently necessary for deciding on a simple and uniform system of fishing-boats' lights. The "International Code of Signals" was then brought under discussion, and a pamphlet written by Capt. Leithauser, of the Hamburg-American line, was put in and eulogized, after which Herr Gustav Holm spoke of the necessity for the introduction of a uniform system of signals by lights and explosives for use in lighthouses and signal stations. The necessity for improving and intensifying the fixed lights on board ship was advocated by Capt. Jacob Holm, who made a series of proposals or suggestions on the subject. The vexed question of the words to be used in passing orders to the man at the helm occasioned a long discussion, in which the German delegates took a very active part, and the result was the adoption of proposals to the effect that the words used should refer to the direction in which the ship's head is to be turned; that it should be left to each nation to decide for itself what words should be used; and that the governments of the maritime nations should be requested to negotiate together for the best possible solution of the question. Dr. Ehlers, of Hamburg, urged the necessity for a harbor of refuge on the island of Bornholm in the Baltic, and many other matters connected with the shipping trade were brought forward and discussed, namely, the load-line, shipowners' liability for collision, wireless telegraphy, tubular boilers, territorial jurisdiction, the saving of life at sea, etc., and the three days' congress (two sittings being held each day) was brought to a close, after the invitation of the king of Portugal to hold the next meeting at Lisbon had been gratefully accepted.

REPUBLIC IRON & STEEL CO.'S FAVORABLE REPORT.

The report of the Republic Iron & Steel Co. for the six months ended June 30 was made public last week and received favorable comment on all sides. Notwithstanding the fact that the company since May 1, 1899, has placed nearly \$4,400,000 in new construction the balance sheet of June 30 last shows a surplus of \$1,934,389. For the six months ended June 30 last the profits from the business of the company after deducting all expenses excepting improvements, renewals and repairs, aggregated \$1,840,526. Deducting the amount charged during the six months to operating expenses for improvements, renewals and repairs, the net profits foot up to \$1,315,708. The two quarterly dividends on the preferred stock, amounting to \$712,491.50, brings the surplus for the six months to \$603,216.51. Adding the surplus on the books on Dec. 31, 1901, a surplus of \$1,934,389.15 on June 30 last is shown.

President Alexis W. Thompson, in the annual report, says:

"The most important events in the history of the company during the last six months have been the completion of the new large blast furnace and other improvements in Birmingham, and of the new billet mill at Youngstown. We have also installed two new blowing engines at our Pioneer furnaces, Nos. 1 and 2, thereby greatly increasing the capacity of these furnaces. We have enlarged our coking plant at Birmingham so as to have a battery of 910 ovens. During the six months we have completed the opening of the Pratt seam of coal in the Birmingham district, and are now mining 2,000 tons of coal per day from this seam, as well as 1,200 tons per day from the Newcastle seam. The coal from both seams is washed and sent to our ovens at the furnaces, producing coke of superior quality and in sufficient quantity for all our requirements. The billet mill is operated in connection with our steel plant at Youngstown, and is recognized to be the most efficient mill now in operation in the country. It was successfully started during the month of April, 1902. The company is now commencing to derive the benefits of these important additions to its plants and, during the next twelve months, it will be further strengthened by the enlargement of its bessemer plant from the present daily capacity of 1,000 tons to a daily average of 1,500 tons, by the construction at our Youngstown works of three new continuous mills of the standard Morgan Engineering Co.'s type, and of another such mill at the company's Moline plant, to supply the large local demand at that place. The contracts for this additional new construction work on our books on June 30, 1902, amount to \$574,612.04.

"In our report of last January we showed the northern ore supply of the company to be in excess of 14,000,000 tons, or sufficient for the require-

ments of our northern blast furnaces for a period of twenty-eight years. Since then we have added, by way of favorable leases, 1,000,000 tons of bessemer ore on the Mesabi range. The constantly increasing demand for the raw material entering into the production of iron, and the constantly increasing drain upon the fields of supply by the increased consumption thereof, as well as other recent developments, indicate that the estimate in our last semi-annual report of \$21,750,000 as the value of the raw material in the ground then and now owned and controlled by this company was certainly moderate and safe. The orders now on our books, as well as the general condition of the business, the decreased cost of production and increased tonnage to be derived from new construction, justify the expectation that our earnings during the next year will be sufficient to pay the preference dividend and the cost of the new improvements in process of construction, and also add substantially to the available resources of the company."

BALANCE SHEET, JUNE 30, 1902.

Assets:			
Real estate, plants, buildings, machinery and other permanent investments			\$41,411,333.44
New construction			4,385,562.65
Stocks in sundry companies at cost.....			162,200.00
New gas pipe lines and gas leases, and prepaid royalties on ore and coal in excess of the amounts charged to operating			322,424.47
Inventories of raw and finished materials			3,046,649.61
Accounts and bills receivable			3,359,215.98
Cash on hand			1,125,185.65
Total			\$53,812,571.80
Liabilities:			
Capital stock issued:			
Preferred	\$20,852,000		
Less in treasury	495,100	\$20,356,900	
Common	\$27,352,000		
Less in treasury	161,000	\$27,191,000	\$47,547,900.00
Accounts and bills payable			3,636,322.97
Preference divided No. 12 (paid July 1, 1902).....			356,245.75
Deferred installments on purchase of coal lands, payable in four annual amounts of \$37,000 each.....			148,000.00
Reserve for taxes and insurance.....			120,380.14
Reserve for possible loss in collection of outstanding accounts and bills receivable, and to cover unknown contingencies			69,333.79
Profit and loss account:			
Net profit during last six months.....	\$1,315,708.01		
Deduct two quarterly dividends of 1¾ per cent. each on preferred stock		712,491.50	
Surplus created during the last six months in excess of dividends on preferred stock	\$603,216.51		
Add surplus on the books on Dec. 31, 1901	1,331,172.64		1,934,389.15
Total			\$53,812,571.80

SHIP BUILDING IN JULY.

The bureau of navigation reports 106 vessels of 28,209 gross tons were built in the United States and officially numbered during the month of July as follows:

	WOOD.				STEEL.				TOTAL.	
	SAIL.		STEAM.		SAIL.		STEAM.			
	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.
Atlantic and gulf	37	861	25	1,353	1	40	4	1,938	67	4,192
Porto Rico.....	2	12							2	12
Pacific	7	3,358	9	315					16	3,673
Hawaii.....										
Great lakes.....	2	34	2	43			5	19,782	9	19,859
Western rivers.....			12	473					12	473
Total.....	48	4,265	48	2,184	1	40	9	21,720	106	28,209

The largest steel steam vessels included in these figures were built on the great lakes.

It is announced that the preliminaries to the formation of the Delaware River Ship & Engine Building Co. have been completed and that the new corporation will receive title next week to the ship yards and other properties which they are to own. The new company will have a capital of \$5,000,000 common stock with 5 per cent. bonds to the amount of \$2,500,000. It is said now that in addition to the Roach yard at Chester, Pa., the Neafie & Levy Ship & Engine Building Co., Philadelphia, will also be acquired. None of the stock will be offered to the public. The titles are now being examined and it is expected that the guarantee company making the examination will be prepared to deliver guaranteed titles within a few days.

The Boston Towboat Co. of Boston, Mass., a few years ago had twenty-six sea-going coal barges. They have sold and lost at sea the entire fleet, leaving them with their sea-going tugs with no business for them. They are offering for sale the tug Herald. She has as fine an engine as any tug on the Atlantic coast, but will need a new boiler in a year or two. They are asking \$8,000 for her. She can be seen at Boston. The Herald was built at Philadelphia in 1881. Her wooden hull is 112 ft. over all, 21½ ft. beam, 11 ft. depth; tonnage, gross, 116. The engines are 22 and 40 in. diameter and 26 in. over all. The boiler was built in 1887. The steam pressure is 90 lbs.

NEW CANADIAN LAKE VESSELS.

Hamilton, Ont., Aug. 6.—Vessel owners in this vicinity are planning on new vessels that will add materially to the Canadian lake fleet. It has already been announced that the St. Lawrence & Chicago Steam Navigation Co., J. H. G. Hagerty, manager, has contracted with the Collingwood Ship Building Co. for a steel steamer of the 5,000-ton kind and that a similar vessel will be built by the same company for James Playfair of Midland. Now it is understood that Messrs. R. O. & A. B. Mackay of this city and their associates practically completed arrangements on a recent trip to England for four new steel steamers. Two of the vessels will be of package freight kind for service between Quebec and Toronto. The other two will be large coarse freighters of about 5,000 tons capacity each for the Michipicoten ore trade. It is planned to have the two large steamers reduced in length when first put together so that they may pass up the Canadian canals. They will carry as cargo across the Atlantic their own middle sections. After arrival on the upper lakes they will be taken apart and the middle sections worked into them. It is claimed that the low cost of building the vessels, as well as favorable terms as to payments, will admit of going to this trouble in having them built on the other side.

The Messrs. Mackay are also negotiating for the purchase of the fast turbine passenger steamer King Edward, recently built on the Clyde. Their intention is to run her between Hamilton and Toronto, making three trips a day. The King Edward would be a novelty on this route. She is a very fast vessel and would cover the route three times a day without difficulty.

Owners of the large freight and passenger steamer Huronic, recently built by the Collingwood Ship Building Co., are figuring on another steamer of the same kind. They may let a contract in time to admit of construction of the vessel during the coming winter.

LAKE SHIP YARD MATTERS.

Some changes in the management of lake yards of the American Ship Building Co. have been made within the past few days. Mr. Alfred G. Smith, who has been superintendent at the Buffalo works (Buffalo Dry Dock Co.), has been transferred to the South Chicago yard where he succeeds Mr. John A. Ubsdell, Jr. Mr. Smith will be succeeded at Buffalo by W. T. Nevens. Mr. Ubsdell goes to the West Bay City yard and will be in charge of all work at that point. Mr. O. T. Warren, who has of late been in charge at West Bay City, will take up duties in the main drafting office at Cleveland under Robert Wallace, Jr., chief hull draftsman. Delay in securing material for the large number of new vessels that are to be built by the American company for next year will cause a short period of idleness at several of the yards. On account of this delay, there is practically nothing now doing at Chicago. It is expected, however, that fair supplies of materials will be secured early next month. The Detroit and Lorain works are quite active, as they are still engaged on three or four vessels that are to be delivered this fall. Improvements involving an expenditure of about \$50,000 are planned at Detroit. The principal improvement will be a large new foundry.

Bethlehem standard open-hearth steel forgings are to be used in engines of a large number of the steel freighters to be built for next season's delivery by the American Ship Building Co. The Cleveland representatives of the Bethlehem company have taken an order for shafting and connecting rods for eighteen of these steamers. The order involves about 350,000 lbs. of forgings, and delivery is to be made within four months. Baldr anchorers are to be used on sixteen of the vessels. The anchor order aggregates about 118,000 lbs.

The Jenks Ship Building Co. of Port Huron is to build a steel hull for the fire boat Detroit of Detroit. The new hull will be 122 ft. long, 25 ft. beam and 13 ft. depth.

STRIKE OF TUGMEN ON THE GREAT LAKES.

Efforts to bring about a settlement of the strike of tugmen of the great lakes, which has been in force practically since the opening of navigation, seemed almost useless when President Keefe of the longshoremen's organization gave the matter up a week ago, on account of what he regarded as unreasonable demands on the part of President McCarle and other leaders of the tugmen. Negotiations for a settlement are still under way, however, and it is the general opinion that there would be little difficulty in coming to terms if the management of the towing interests was dealing with the men who are actually employed on the tugs. In this strike the disadvantage of treating with men who hold positions of authority in the union, but who are not employed in the business, is especially aggravated. This is an old story with labor unions. In this particular case it has certainly prevented a settlement between the men and the employers, and whatever the outcome may be the men will undoubtedly find that in any organization of the future they will fare better in all dealings with their employers if they can get rid of the element within their ranks that is not employed on the tugs and therefore not directly interested. Mr. Keefe has not, of course, been talking for publication since his mission to Cleveland failed to settle the strike, but it is clearly evident that if the tugmen are to be a part of the longshoremen's organization they must get rid of the deadwood in their unions. It is also quite well settled that there will be no sympathy strike.

The proceedings before the treasury department are still under way and more men are gradually being put to work by the Great Lakes Towing Co. at different points around the lakes, thus complicating the conditions involved in a settlement, so that there is cause for regret on both sides that nothing was accomplished in the conferences of a week ago.

Capt. Lansing H. Beach, United States engineer in the Detroit district, has returned from a three weeks' inspection trip of the lights and beacons along the lakes and rivers as far as Duluth. There are several changes which he proposes to bring about, notably in the St. Mary's river where the ranges are not, in his judgment, conspicuous enough. Capt. Beach pays the highest compliment to a new Canadian range which has just been completed in St. Mary's river and says that he will write to Ottawa in an endeavor to get the plans and, if possible, adopt the Canadian engineer's idea.

MAJOR SYMONS' ANNUAL REPORT.

The annual report of Maj. T. W. Symons, United States engineer at Buffalo, to the chief of engineers, is a most exhaustive document and goes minutely into the commerce of every harbor under his jurisdiction. By far the greater space is devoted to the port of Buffalo, though no new work is projected there. The great labor of the past few years at that port has been the construction of the breakwater. Upon this work he says:

"The progress of the work on the breakwater extension has not been as rapid as desired by this office or as called for by the contract obligations. At the same time it is recognized that in a work of the magnitude of this, with new and hitherto untried features and with the necessity for procuring materials in enormous quantities, much allowance must be made. The close of the fiscal year 1902 finds the work progressing with great rapidity. The contractors have added to their plant until it is apparently sufficient and suitable; the quarries have been opened fully and have turned out remarkably well, the stone procured from them being of excellent quality and of very large size and perfect in shape. If the season is favorable for work the entire structure can be completed before inclement weather compels cessation of work this fall. The placing of the capping stone below water, however, requires quiet weather and it is possible that sufficient quiet weather may not be available for it all to be placed. It is, however, practically certain that the entire new breakwater will be completed before the close of the fiscal year 1903. No further appropriations will be required therefor. The only appropriation hereafter required for Buffalo harbor under the existing contract will be for maintenance. There is another item properly chargeable to maintenance which should be provided for. Due to the construction of the north and south breakwater and other causes there has lately developed a strong cross current from south to north across the entrance to the harbor between the breakwater and the end of the south pier. This has set several ships aground on the shoals, limiting the entrance channel to the north, and makes it plainly evident that the entrance channel between the south pier and this shoal should be widened. To do this properly and maintain it means the removal of a portion of the south end of the Erie basin breakwater built by the state of New York. It has long been recognized that the southerly end of this Erie basin breakwater is an obstruction to navigation, and before 1868 it was proposed to cut off 212 ft. of it, provided the consent of the state of New York could be obtained. The state of New York under date of April 27, 1868, passed an act authorizing the United States to remove 212 ft. of this breakwater. It has never been removed. Under the new conditions which have arisen its removal has been more imperatively necessary than ever. To remove this portion of the Erie basin breakwater and the shoals in front of it, thus properly widening and maintaining the entrance channel to Buffalo harbor, will cost, it is estimated, \$30,000."

The projected improvements of Erie harbor are summarized as follows: To repair the existing structures; to extend the north pier 500 ft.; to extend the south pier 1,000 ft.; to dredge the entrance channel to a depth of 20 ft.; to dredge a portion of the eastern end of the bay, needed for access to docks, to a depth of 20 ft.; to build four protection jetties along the outside of Presque Isle peninsula. The estimated cost of these improvements is \$377,000. The total amount already expended on Erie harbor is \$1,051,973.25. The maximum draught that could be carried into Erie harbor at present is 18½ ft.

Regarding the improvements at Dunkirk, Maj. Symons says: "A large portion of the main breakwater is old and more or less dilapidated and liable to be seriously damaged by seas, necessitating repairs, and money for these repairs and for continuing the improvement of this harbor has been appropriated by the river and harbor act of June 13, 1902. The work will be done as soon as practicable."

Speaking of the breakwater at Oswego, N. Y., he says: "The necessity for a general strengthening of both the substructure and superstructure of the outer breakwater is evident and urgent."

The balance of the report deals with harbors of minor navigable interest.

DULUTH-SUPERIOR HARBOR IMPROVEMENTS.

Capt. D. D. Gaillard in his annual report to the chief of engineers regarding improvement in the Duluth-Superior harbor has recommended that \$150,000 be appropriated to purchase a dredge plant to keep the channels open. The estimated cost of the new piers to replace the old ones at the Wisconsin entry is \$925,000. To meet the existing liabilities under the present contracts and those yet to be made for land and other necessary expenses, to June 30, 1903, exclusive of work on the Wisconsin entry, it is estimated that \$282,358 will be required. July 1, 1901, there was an available balance of \$687,358, leaving \$405,000 available for the rebuilding of the piers at the Wisconsin entry. The estimated cost of the piers being \$925,000, and the amount available being \$405,000, left \$520,000 to be provided to build the piers. He therefore recommends a total appropriation of \$670,000. Capt. Gaillard's report also shows that nearly all the lands needed in connection with the Duluth-Superior harbor projects have been acquired and that the dredging contracts will soon be completed. When completed there will be over sixteen miles of dredged channels, varying in width from 120 to 600 ft. and turning basins of an aggregate area of about 360 acres, all safe navigable depth of at least 20 ft.

Capt. Gaillard's estimate of the amount of material that will have to be removed annually from the channels after the dredging contracts are fulfilled, is about 450,000 cubic yards. This material will be deposited in the channels and basins by the running in of banks and flood deposits, and for this reason he reiterates the recommendations of his predecessors for the establishment of a government dredging plant, instead of having the work done by contract.

The Canadian Pacific Railway Co. is erecting a new 3,000,000-bushel elevator at Fort William, Ont. On the piles, of which there will be 5,000, will be laid the concrete upon which the steel structure will rest. The contract calls for its completion in time for this year's crop. Elevator D, which was damaged by fire last spring, is being overhauled and the capacity will be increased to 2,500,000 bushels. This is a steel tank elevator. Thirty-two new steel tanks will be built, the foundations of which are being laid.

DOCK CONSTRUCTION IN AND AROUND BUFFALO.

Mr. S. M. Keilland, a member of the American Society of Civil Engineers, lately read an address before the society upon the subject "Dock Construction in and Around Buffalo." As the subject is of some interest to navigation it is herewith reproduced:

"The subject of docks and wharves is a very timely subject for us engineers to consider. This question in all its bearings is about the most important concerning the future of Buffalo. Something more systematic ought to be done. A general plan should be developed and afterward the details would follow. This patchy, irregular, haphazard way in which this important question has been drifting is unworthy of a progressive, intelligent and well-informed population such as we boast of having. It is unworthy of us engineers. In connection with this question comes, of course, that of raising the levels of Lake Erie by a dam, deepening the channel of Niagara river, etc. To me it looks as if a 3-ft. rise of the water level is too much. A rise of 18 to 20 in. would be more nearly correct considering the many improvements which would be damaged and abandoned by the higher level. Otherwise 3 ft. would be the best. It would be very easy to increase it later on to 3 ft. if found desirable. To come to the right conditions in all these improvements, to make the right designs, we have to know and understand the condition of those underwater foundations as well as those above, which comes from wind and weather and waves, as well as the usage to which our docks are going to be put. In the immediate future, and even now, many questions relating to harbor, docks and wharves are upon us. Ill-selected or well-selected designs mean a great deal to ourselves as well as to those whom we serve as engineers or agents. The new breakwater is nearly finished; the outer harbor has many conditions different from the more sheltered river and city ship canal. I do not see the need or time or place to go into many construction details or to those relating to the strain, strength or load. These questions may be treated in each case as they come up. The first questions which appear in construction of wharves or docks are their location, the purposes for which they will be used, if on the inner or outer harbor. From these come the questions of foundations. In a general way I think it is correct to state that rock foundation is to be had from the present harbor entrance of Buffalo river and northward along Erie basin and down the river. In a great deal of this a portion of the rock has to be mined away so as to give sufficient depth to vessels; also, that a good pile foundation can be obtained south of the harbor entrance up along the river to near Erie elevator and to south end of lot 2 on the Blackwell canal. Piles will reach rock 30 to 45 ft. in length below city water line. Above the Erie elevator on the river all structures can be built direct on the rock; this as far as the present navigable portion is concerned. Cribs, masonry and concrete here make the most suitable wharf frontage. When rock dips down to a greater depth on the river, good pile foundation can always be had.

"Nearly all wharves or heavy structures which are going to be built east or south of the points mentioned will demand heavy, long piling. On the Tift farm soundings or borings were made, and rock was reached at a depth of 50 to 80 ft. below the surface. I believe that up toward Stony Point the rock rises again a little, but a great portion of this land was covered with a thicker layer of muck and soft clay and, therefore, requires piling in proportion. On the Tift farm, as well as on the Blackwell or City ship canal, there is found a stratum of harder material from 20 to 40 ft. below the water. It gives usually a good bearing for piles, yet, if the pile is driven hard, it will penetrate this layer and a softer material is entered. On the Tift farm, where many thousands of piles are driven 60 to 70 ft. deep, many were spliced. I feel confident that equally good results could have been reached by using shorter piles, either driven to the hard stratum or only 50 ft. long. The suction or cohesion is here equal to a very good foundation for the point and much more economical.

"The docks most common in Buffalo can be divided into the following kinds: Excursion docks, lumber docks, docks for rails, stone and similar heavy stuff, ore docks, retaining docks. All these docks ought to be designed according to the use they are going to have. A dock that is built for a certain purpose or a certain load should be proportioned for that purpose or load. If we put 500 lbs. on our back to carry, most of us will sink down—our knees give way. So with a dock if loaded beyond its strength and foundation. Also, if you put too much money and material into a structure, it is equally bad practice. It seems ridiculous what wise faces are put forth when these natural collapses occur. Instead of finding it perfectly correct, it is attributed to extraordinary reasons and mysterious causes—the construction was wrong, the foundation was not understood, the load was too heavy. It would take a large book to write only a small portion of what there is known related to wharves. It would also require many illustrations. I have not time or intentions to do anything here beyond giving a few suggestions.

"An excursion dock is, as a rule, the lightest dock. It ought to be strong enough to stand a packed crowd of people with their luggage and bear the bumps of the steamers. It ought to be carefully constructed, elastic and well tied together; and there must be no chance for it to give away, as it has the most precious load—human life. There ought to be on these docks apparatus for saving life—ropes, boats, buoys, etc. There must be appliances to and from which boats can easily be secured and released. If the dock is built upon piles, those can be 10 to 12 ft. apart, with split caps 3x12-in. joists. It should have several continuous girths as fenders. The top planking ought to be well tied down and the whole structure bound together with bolts and spikes. Such excursion docks are, of course, of a temporary construction. When the city begins to build permanent docks along the river front, where rock foundation can be had, cribs with concrete or stone fronts above water are the thing to build.

"Of lumber docks we have many. They are usually made by pile bents, 8 to 12-ft. centers and with two to three piles in a bent. The bents are often tied back to anchor piles at intervals of every other bent, usually sheet piling behind the dock. These docks must be strong enough to receive the lumber as unloaded from the ships, and they may at times have to sustain stacks of lumber 15 to 20 ft. high, but, as these are soon removed and stacked or stored on adjacent land or in lumber yards, and, as timber is not high in specific gravity, the load, neither on the dock nor on the near land, comes very high per square foot. Besides, there are always left spaces between piles for driveways. These docks seldom have any accidents. They are built rough. There ought to be a sufficient number of snubbing piles. There is a great variety in lumber docks. Some are built

with only two rows of piles, with sheet piling. Others, like those of the 'Lehigh' built on the Tift farm, were about 42 ft. wide, bents 12 ft. apart, with 6 or 8-in. piles in a bent. I do not consider that these docks were economical. They cost about \$25 to \$28 per foot. They were without sheet piling, but washing down and caving has necessitated this to be done later on.

"It gradually became necessary to have stronger docks than the lumber docks. Then docks with the bents only 6 to 8 ft. apart, with piles in these only 3 to 4 ft. between, were built. These wharves have to sustain loads of steel rails 8 to 10 ft. high; sometimes, also, the cars from which they are unloaded. These docks ought to be wide and should be extra strong in all parts; the exposed parts to be oak timber, to stand the rough handling which naturally follows from these cargoes. The piles must be driven to good bearing, either to rock, if this not too far down, or to the stratum of hardpan before mentioned, at a depth of from 30 to 45 ft. Once in a while, when a sliding or breakdown occurs, we hear about a stratum of quicksand as being the cause. This is supposed to relieve the engineer or contractor. This providential quicksand has interfered with work which I have had in charge myself. When the foundation pit for the railroad bridge at Hamburg turnpike was sunk, we found in the pits, 18 to 20 ft. down, several thin layers of sand in between the clays. They seemed to conduct water and might be the offending quicksand.

DESCRIPTION OF THE IRON ORE DOCKS.

"The iron ore docks are somewhat new in this locality. They have to sustain an enormous load, and almost all the first docks have failed. They have caved in on the Tift farm, on the City ship canal and on the river. It looks as if a strong enough construction has now been found. The iron ore dock on the Tift farm which gave away was one of the lumber docks described. Special foundations were made for the Brown hoist which handles the ore. The ore was piled close up to the back of the dock, when suddenly the ore heap, which was unloaded on planking laid on mud sills, sank down. The natural surface of the Tift farm had here been covered with a layer of clay 6 ft. thick. The original ground consists of 2 to 3 ft. of black muck and under this a foundation of glacial clay, rather plastic. This foundation gave away. The ore might have been unloaded to a height from 25 to 30 ft. in big heaps as it sank down. The movement pulled the dock piles up, so the dock line for about 200 ft. was not only pushed into the canal about 12 to 15 ft., but also elevated in a parabolic shape, with a maximum rise of about 12 to 15 ft. The ore as it sank pushed the clay up so that it formed a dam. No water came into the sinkhole or cavity, and the Brown hoist, when readjusted, took the sunken ore out of the cavity. After this the ore heaps were placed farther away from the front; besides, sheet piling was driven back of the dock. The general conclusion I have derived from these experiences in Buffalo is that iron ore can be unloaded with safety if there is plenty of margin between the wharf and the heaps and if the load can be placed far enough back. There ought to be a plank flooring to facilitate shoveling. If the space is narrow, there are two ways, either to strengthen the foundation with a pile-supported floor or else build an exceedingly heavy front, either by cribs or piles; but both have to be anchored very strongly to sheet piling or anchor piles. Cribs without these, standing on our slippery clay, are both sure to slide and to sink. If they are not sunk considerably below the bottom of the harbor or canal, their toes ought to have a good catch besides the anchors. If there is a rock foundation, it looks as if cribs sufficiently wide, with a good catch for the toe, are a good construction after they have well settled and gotten into a permanent shape. A concrete and stone wall for the portion above the water line, and interwoven with steel beams and rods, gives a lasting construction.

"Retaining walls, or wharves in front of warehouses, act in most cases only as fenders to keep the ships and blows away from the building. These buildings are or ought to be built on independently constructed piers.

THE OUTER HARBOR OF BUFFALO.

"As for the outer harbor. What are we going to do with it? Is it only to serve as a protection for the beach and the mouth of the river, or will it also cause a new and large development of docks and wharves along the shores of Lake Erie inside of it? We will hope the breakwater will be strong enough to withstand the severe storms which at times occur. On the seacoast, where a much heavier swell develops, it looks at times as if nothing could withstand the power of the furious waves.

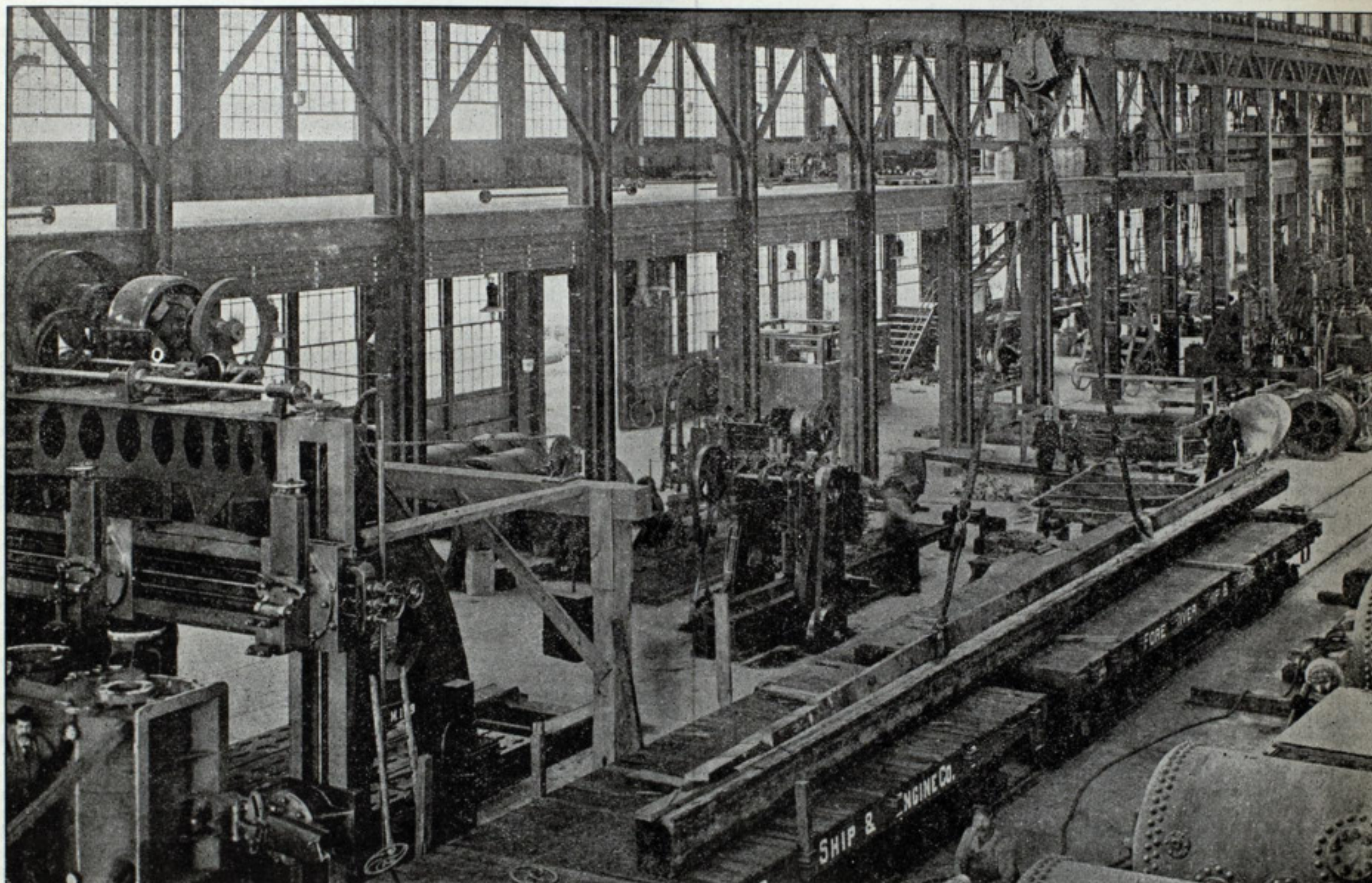
"In England, a few years ago, I saw at the mouth of the River Tyne how the waves had struck the top of the breakwater or mole and had shifted a top layer of concrete apparently 100 ft. long and 6 to 8 ft. thick. It had torn it loose and turned it around as if a turntable. There is a stretch of frontage on the lake shore three to four miles long—not a dock built out from it. Nearly all this frontage is owned by the railroads. What they will do is, of course, their own business, but we can clearly see it will cost considerable money to build walls or docks. It appears now that the business which can be expected will be loading and unloading of flour, lake package freight, shipping of coal, discharging of timber, etc. A pile dock of considerable width, well strengthened and fendered toward its outer end or pier head, is the most economic construction. It is also the quickest to construct. The construction is simple, so I will not try to describe it. In some cases it may be profitable to sink crib bulkheads and fill the excavated material behind. A strong pile and sheet piling bulkhead may also be found good economy, tying the opposite sides well together, something like cofferdams, the material dredged in the vicinity to be used to fill. Where cribs are used, a bed made from broken stone of good thickness and width is worth considering. About twenty years ago, when I was employed in Norway in building a bulkhead and wharf, it was located at the mouth of a small river as this entered into a fairly well-sheltered bay. We drove a row of piles about 4 ft. centers as a front. About every other one of these piles was anchored back to several piles driven on a slant. The full depth was dredged in front of the piles. Great panels, made of double plank, were pushed down back of the piles, forming a wall. They were held down by being pushed under a girth bolted to the back of piles at water line. Dredged material was unloaded back of these piles up to a height of about 7 ft. above water. We charred all the front piles before they were driven, burning a heavy coat of coal tar into the wood. This construction has stood exposure for twenty years and has been used as a lumber and light dock. I have not yet seen any cast-iron piles being used in these waters. These, we know, have an

auger-shaped point, which is bored into the sand or clay. These hollow cast-iron tubes could be strengthened with steel rods inside of them, and the cavity filled with concrete. A few of these piles bound together by steel beams would, in many cases, make a lasting and practical pier in the waters of our outer harbor. Cast iron withstands the action of fresh water for a very long time. Along the Niagara river, especially between Black Rock and the Erie basin, rock is encountered so near the surface that cribs with stone and concrete fronts will be the most frequently used. Much of our harbor and river frontage is owned by the railroads. These have many considerations to take different from those of the municipalities. Even down on the seaboard, where we find their important terminals, very few wharves have been built from other material than from piles and timber. Therefore, I expect that here we also for a time will see mostly timber wharves built, though permanent structures will also become more frequent. The construction of a wide, well-paved street along the front, facing toward our new harbor, from the lighthouse to Stony Point, must be considered a necessity as well for the railroad as for the public. Such a well-paved street and boulevard, both for private driving and for heavy trucking, carrying people and loads to and fro, would create new business. The city ought to have on this stretch a wharf of its own, having fixed charges for the use of same either by the hour or day. A bridge or tunnel has to be provided by which this locality could be reached more conveniently than at present. It would be most desirable to cross the river and canal near the foot of Main street or even farther out near the mouth of the river. A tunnel has very objectionable features. It is damp and very expensive, and a bridge is also an obstruction. Perhaps the best way

heavier, lands are more expensive, some material costs more, some less. There are, of course, special features characteristic of each locality. Thus, these fresh-water lakes differ from those of salt water. Down on the coast they have the teredo, which destroys piles and timber. Here we don't need to fear them, and timber, from water line down, is a splendid material for harbor structures. Also iron and steel corrode quicker near the ocean and salt water."

FORGING THE STEM OF THE POWHATAN.

The accompanying photograph shows a stem forging shipped on by the Fore River Ship & Engine Co. from their yard at Quincy, Mass., to the J. N. Robins Co., Erie Basin, Brooklyn. This stem, which is for the steamer Powhatan, is 59 ft. long, in one length, 10½ in. by 2¾ in. at middle of length and tapering for 20 ft. into a spoon scarp at heel, and rabbetted for a distance of 36 ft. from top end with forward edge rounded; the finished weight being 5,370 lbs. Work was started in the forge on the morning of the 17th ult., and the machine work completed at 6 o'clock a. m. of the 22nd ult., being just five days, which is unquestionably record time. As an illustration of the exceptional facilities and equipment of this new and extensive ship building plant, it is interesting to relate that they have just made a tender to the American line to renew a section of intermediate shaft for the Belgenland which sailed from Philadelphia July 5 and was towed disabled into Halifax on the 19th, this shaft to be forged and finished complete, except coupling bolt holes, in four days, which would be a dispatch that has never been approached by any concern in



Rabbetted Stem 59 ft. long for the Steamer Powhatan, forged, machined and shipped in five days by the Fore River Ship & Engine Co., Quincy, Mass.

would be to widen the Michigan street bridges; make them more convenient, with wider approaches. These are matters worthy of the most intelligent consideration, and now is the time to consider them.

"As I have said before, I have not presented this with much or any claim for originality in the matter treated, but its purpose is particularly to call your attention and to help to create an active sentiment. I think this society ought to take the lead to form public sentiment and understanding in these matters. We would benefit from it as well as the city. The water frontage of our city has been neglected. The city ought to find out where it is, and plans should be outlined and framed as to what ought to be done. In these lines of engineering, as in most others, the best to follow is the one where the dollars invested give the biggest returns. Often we see work fall to pieces and decay; then we are inclined to believe something or somebody is wrong. Yet this apparent poor piece of work was probably the best for the occasion. It has served its purpose. America, with its growth, its vastness and its shifting conditions, could not be treated in construction as countries in Europe. When I first came here, I saw many railroads, with their timber structures, culverts, tunnels and bridges. They were not the structures which old civilized countries would have built, but to open up this great, large country to find new homes for the flow of immigrants several years would pass before much returns would come on the invested capital. Therefore, the trees standing near the right of way of the railroads was the material to use instead of expensive structures made from iron and high-class masonry. So it has been and will be yet for awhile also with the wharves. Timber and piles will yet be used for a long time. The structures along our harbors in the near future will require more knowledge in their design. Loads are

this country. This is the only ship building plant in this country with a forge equipped for making the very largest of engine forgings; for instance, each section of the double throw crankshafts for the battleships which they are building will be worked from a 40-ton ingot. The forge department also includes a plant for oil tempering and annealing shafts 55 ft. in length and of any diameter, also smaller furnaces and baths for treatment of the other forgings.

The Hon. J. Israel Tarte, minister of public works for the dominion of Canada, is at present making a tour of the great lakes in the steamer Lord Stanley. In an interview at Chicago he said that the time had come when the United States must share her commerce with Canada. He maintained that Canada has the route to the ocean and would make a trade that would attract trade. He said that the first work of great importance would be the widening of the French river from Georgian bay to Lake Nipissing. He said that the work on French river would cost altogether \$5,000,000 and that the completed route to the ocean would involve an expenditure of \$80,000,000.

The building of the two new dry docks of the balance type for parties at New York has been begun at the yard of Harry Cossey at Verplancks Point on the Hudson. One dock is for the Townsend & Downey Ship Building & Repair Co., Shooter's Island, N. Y., and the other for James Tregarthen, Son & Co., also of New York. The Townsend & Downey dock will be 160 ft. in length with outriggers of 30 ft. in length each and the Tregarthen dock will be 186 ft. in length with 35 ft. outriggers.

FINAL REPORT OF BOILER COMMITTEE.

MORE DEFINITENESS IN THIS LAST DOCUMENT THAN HAS CHARACTERIZED PREVIOUS REPORTS—A DETAILED SUMMARY OF CONCLUSIONS.

Glasgow, July 29.—A summary of the final report of the navy boiler committee has doubtless been cabled to you, but I propose to give some details which cannot have been cabled, and also some comments. The navy boiler committee was appointed on Sept. 6, 1900, and there are throughout the report many indications that the members consider that their work might very well be continued, especially as they seem unable to fix definitely upon a type of boiler which will serve all the purposes and yet be durable. This can only be determined by experience with the various water-tube boilers while the ships are in commission, for the trials of the Niclausse, Babcock & Wilcox, and other systems have either been on too small a scale in the British service or of too short duration to enable definite conclusions to be arrived at as to the endurance of the boilers and the maintenance of their efficiency after a period of time. There is, however, about this last report more of definiteness than characterized the preceding report. The advantages of water-tube boilers for naval purposes are so great, chiefly from a military point of view, that, providing a satisfactory type can be adopted, it would be more suitable for use in the navy than the cylindrical type; but the committee are pronounced in their opinion that the Belleville boiler has no such advantage over other types as to lead them to recognize it as the best type to be adopted in the navy. At the same time they fully recognize that the Belleville boiler, when new and in good condition, is a good steam generator, but its rapid loss of efficiency in ordinary work in commissioned ships, the serious character of the defects which have been developed in it, and the great care required in its manipulation, render it, in the opinion of the committee, undesirable to fit any more of this type in the navy. To obtain satisfactory results in working the boilers in the face of the disadvantages named more than ordinary experience and skill are required on the part of the working staff. The committee find that serious defects in the boiler casing have made their appearance in several cases, and have rendered the vessels in which they occurred unserviceable for long periods. Elaborate details of repairs indicate a very wide variation in the extent of defects not only in the boilers, but in the casings, and this notable feature has led to the conclusion that many defects are not inherent to the system but rather to the manufacture, or to the supervision given on board ship.

The committee in dwelling upon the defects name several which are peculiar to the Belleville type. These include the corrosive decay of the baffles in the steam collectors, and of generator and economizer tubes, now greatly reduced by the use of lime and zinc; but great care has to be taken to prevent choking of the water gauge connections in consequence of the free use of the lime. The next is the rapid wear of the working parts of the automatic feed apparatus, and the non-return valves in the down-take pipes. The third is the melting of fusible plugs owing to defect of uncertain circulation; the fourth is the deposit in the tubes about the water line, but specially in the wing elements, due to impure feed-water and involving failure of the tube; and the fifth, and last, is the excessive expenditure of coal and of fresh water for boiler feed make-up, as compared with vessels fitted with the cylindrical boilers.

The committee point out that, as compared with the cylindrical boiler, satisfactory water-tube boilers should possess the following advantages: Less delay in steam raising; less liability to damage if the boiler be struck by a projectile; greater ease of repair and renewal of parts; less weight for the power generated, considering the weight of the boiler installation only; ability to carry a higher steam pressure; and greater fire-grate area for the same floor area, with consequent less forcing for full power. These advantages are possessed to a considerable extent by the Belleville boiler, and on the competitive trials of the Hyacinth and Minerva the Belleville boilers proved more efficient, as regards evaporation, than the cylindrical boilers as originally fitted, but after the retarders were fitted in the latter the efficiencies were nearly equal. The long runs to Gibraltar and back also proved that in several respects, notably in the loss of feed water and in economy of coal consumption, as well as in the immunity from accident during ordinary working, the cylindrical boilers were considerably superior to the Belleville.

The committee are still of the opinion that the Babcock & Wilcox, Niclausse, Dürr and Yarrow large tube boiler, all of which are of the straight-tube type, merit, as proposed in their first report, extensive trial in the navy. These types have few of the disadvantages of the Belleville boiler with most of its advantages. They all have "downed" tubes, and the water level, as shown by the gauges, is practically the level of the water in the boiler; they do not require a much higher pressure to be maintained in the feed pumps than in the boilers, nor in the boilers than at the engines; the use of automatic feed regulators of an extremely delicate type is not necessary; the circulation is fairly well defined, and is much freer than in the Belleville; from such experience and evidence as the committee have had before them the loss of water will be much less than with the Belleville; and, finally, they appear to be much more likely than the Belleville to be free from accident under ordinary conditions of service. The Babcock & Wilcox boilers in the Wilson liner Martello made 91,000 miles running in fourteen months, with less than a week in port at the end of each Atlantic run, and the only repairs required had been those of the ordinary upkeep of any boiler, while only six tubes required renewal. Similarly satisfactory results are noted in connection with other merchant ships, and the same type of boilers of the Sheldrake were found in good condition, and had given little trouble. As regards the Niclausse boiler, the only expression of opinion is that those in the Seagull are several years old, and have proved generally satisfactory. As to the Yarrow boiler, it is anticipated that the use of tubes of 1¾ in. in diameter will be more efficient and give better results than the small tubes in "express" boilers. Two methods of heating the air have been fitted in connection with Yarrow boilers in the Dutch and Austrian navies, one by means of tubes in the up-take, and the other by fitting an outer casing completely over the boiler and the up-take, and passing the air supply through the space so formed.

From the evidence it appears that no type of water-tube boiler at

present in use is on general service as economical as the cylindrical boiler, and that a large percentage of the coal used is expended for auxiliary purposes in harbor. Until a thoroughly satisfactory type of water-tube boilers is obtained, the committee recommend that in large cruisers and battleships cylindrical boilers of sufficient power to work the auxiliary machinery and to drive the ship at her ordinary cruising speed should be fitted, the steam pressure being the same for the water-tube and cylindrical boilers—210 lbs. per square inch, so as to give 200 lbs. at the engines. By this means considerable saving in coal will be effected. The water-tube boilers could, when not in use, be kept clean, and perfectly efficient for driving the ship at high speeds when economy of coal relatively is not so important. The cylindrical boilers should be fitted with retarders in the tubes, and with special means for circulating the water while raising steam. The committee recommend that retarders should be fitted in the tubes of all cylindrical boilers, believing that they will render existing boilers more efficient and economical than at present. The former recommendation of the committee to fit a combination of cylindrical and water-tube boilers has been carried out in the case not only of one of the battleships of the King Edward class, but also in the cruisers of the Devonshire class, the four types of water-tube boilers recommended—Babcock & Wilcox, Niclausse, Dürr, and Yarrow—being utilized.

Altogether, the committee considered thirty-six boilers out of which they made their selection of four, reserving the other four for future consideration. As to the small-tube boilers, they pronounced the opinion that they are unsuitable for vessels above the size of third-class cruisers; but Mr. List, one of the members of the committee, thinks the Thornycroft-Schultz is fitted for use in combination with cylindrical boilers, provided the tubes are not less than 1¾ in. external diameter, and of a given thickness; that the curvature of the tubes is such that a flexible cutter can be passed through them for the removal of scale; that the arrangement of the tubes is such that there will only be a small percentage of discharge from the tubes above the water line, and that there are no air locks in them when the boiler is filled right up.

In the British merchant fleet the Babcock & Wilcox boiler alone is in use in ocean-going steamers—Wilson, Peterson-Tate, and Allan liners—in which latter one such boiler only is fitted to assist the original cylindrical boiler. In the United States merchant marine the same type of boiler is used to some extent, principally in ships plying on the great lakes. Niclausse boilers are being installed in two very large ships of 15,000 H.P. In France, Belleville boilers have been working in vessels of the Messageries Maritime Co. for many years. The French Transatlantic Co. have fitted two small vessels, one with Belleville and the other with Niclausse boilers, for comparative trials. In the German navy the Dürr boiler has been adopted for all large cruisers, while a combination of cylindrical and small-tube types is retained for battleships, but small-tube boilers are exclusively used only in the smaller cruisers. In the Dutch, Austrian and Swedish navies the Yarrow boiler is very largely in use. In the French navy the authorities seem to be undecided at present as to what boiler to adopt. In the large cruisers recently ordered they have chosen a different type for each ship, probably for comparative trials. In the American navy many Babcock & Wilcox boilers are in use, although recently Niclausse boilers have been ordered for four of the largest ships.

The committee were asked to report generally on the suitability of the propelling and auxiliary machinery in warships. They find that the machinery fitted in recent war vessels is "generally suitable," and they make a number of recommendations, many of which have already been carried into effect. They consider it desirable, where practicable, to increase the length of piston stroke and to reduce the number of revolutions per minute, a point referred to at some length in their special report upon the Hyacinth and Minerva trials. Where two main condensers are fitted to each set of main engines, as is now the practice, auxiliary condensers need not be fitted, the auxiliary engines exhausting into the main condensers. But from this Mr. List dissents. Jacketing of the main cylinders is a practice introduced in the early stages of engineering to reduce the amount of condensation within the cylinders, but with the piston speeds now adopted, jacketing is of doubtful advantage even at comparatively low powers. The committee think that all jacket steam and drain connections on the high-pressure and intermediate cylinders may be omitted without loss of economy, and that even in the low-pressure cylinder they should only be retained in the case of second-class and larger cruisers. They also recommend independent steam-driven air pumps for the following reasons: (1) That the main engines would be relieved of reciprocating parts requiring much attention when running at high speed. This would obviate a risk of excessive loads coming on the pumps due to irregularity in the supply of water in consequence of the rolling and pitching of the ship. (2) The work can, at all powers, be adjusted to the air leakage on the engines with resulting economy. (3) The vacuum can be maintained and the condensers kept thoroughly drained while the engines are not at work, thus making it more easy to handle the engines. (4) Hot well pumps may be abolished. (5) With slow-running pumps the water can be delivered into the hot well tanks more free from air than in the case of pumps driven off the main engines. (6) Auxiliary air pumps may be dispensed with. It is computed that this change alone in the engines of a 22,000 I.H.P. cruiser would effect a saving in weight of 10 tons. As regards the main feed pumps they should be placed in the forward parts of the engine rooms, and their speed regulated by float-control tanks. Pressure gauges should be fitted on the feed discharge pipes in each firing space. As to the steam pipes, the use of lap-welded wrought iron in preference to steel for pipes over 4 in. in internal diameter has advantages, as they are cheaper, more easily obtained, as reliable and less affected by corrosion than steel pipes, and in the larger sizes a riveted covering strip over the well is not required. In the arrangement of steam pipes large bends should be fitted where practicable, in order to take up the expansion of the pipe, and packed expansion joints should only be used where bends cannot be arranged. The committee express preference for outward-turning screw propellers, but suggest experiment with warships. They refer to the enormous amount of machinery which has to be crowded into comparatively small space, and state that there is a danger that, owing to difficulty of access, parts may not be examined as frequently as desirable. This inaccessibility would be still more serious under the stress of actual warfare, and it is recommended that in future designs more engine room

space per horse power should be provided than at present, even if provision has to be made outside the main engine room for part of the machinery.

Mr. List suggests that experiments should be made with retarders, but without the ferrules fitted to the junction of tubes, and tube plates of cylindrical boilers. He thinks that the damage to the casing of a water-tube boiler might be overcome by increasing the amount of brick work and of non-conducting material and by using thicker plating. He contends in favor of standardization of engines for each class of ships, favors nickel steel for machinery work, and on the question of the electric driving of auxiliaries he submits that motors are suitable for driving fans of moderate size, small centrifugal pumps, and, in some situations, geared crank pumps, but that they are not suitable for use with capstans, hoists, winches, or other appliances essential to the safe handling and fighting of the ship, and in which the load may exceed the power of the motor, as, in that case, the fuse may be burned out or the armature damaged at a critical time. As to the Thornycroft-Marshall, Weir, and Stirling boilers, all of the large-tube type, which have passed the experimental stage, he thinks that they are worthy of trial in vessels attached to dock-yards, where their performance could be carefully watched and where trials could be made at sea for extended periods under service conditions.

HISTORY OF THE CRAMP SHIP YARD.

The William Cramp & Sons Ship & Engine Building Co., Philadelphia, has just issued a little book giving the history of its company. The book is not only well done but it makes mighty interesting reading. The ship yard was begun by William Cramp in 1830, when he was only twenty-three; and for forty-nine years he remained at the head of it. When he set up for himself there were twelve other yards along the Philadelphia water front, all quite as large as his. Only one now remains of these twelve, the yard of Neafie & Levy, which of late years has become like its rival a place for the construction of vessels for the government. In the thirties, and for years later, the capital needed to erect a ship yard was little. Sheds, sawmills, slips and water frontage were all that was required. Most of the work was done by hand; hatchets and adzes were in constant use, where now steam and compressed air plants puff and wheeze as they work. A single tool in Cramps' ship yard today, the floating derrick Atlas, cost more than the entire equipment of William Cramp's yard even twelve years after it had begun operations. All the tools that had been used in building the wooden ships of the days before the war had to be thrown away in the late sixties and early seventies, when the wooden vessels disappeared, and an entire new plant had to be erected. William Cramp was able and willing to make the sacrifice necessary to save his business and to that fact is due the survival and growth of the Cramp yard, when all but one of the older concerns have gone out of business.

The Cramp yard has changed its location once, and extended its borders many times. In 1830 it was at the foot of Otis street, now called East Susquehanna avenue. Then it moved to the foot of Palmer street, where its dry dock is still maintained. Now the main yard is further north, at the foot of Cumberland street. Today the main ship yard covers forty-six acres, while the docks at the foot of Palmer street cover nearly six and a half more, making a total of 52.4 acres. The principal building is 1,200 ft. long and 72 ft. wide, with a ground and floor area of 460,000 sq. ft. It contains the bending shed, blackboard shed, ship shed, joiner shops, moulding lofts, pattern shops, and machinery and store rooms, and is one of the largest structures under a single roof in the world used for mechanical purposes.

There is a boiler shop with 62,000 sq. ft. of area, a machine shop with three floors covering 85,000 sq. ft., and among other less important buildings, the blacksmith shop has an area of nearly 31,000 sq. ft. The main ship yard has a water front of 1,517 ft., more than a quarter of a mile; and the wet docks cover 200,000 sq. ft. The wharfage in the yards is just about one mile in length.

There are eight building slips, four with a building length of 480 ft. each, two of 500 ft. each, and two of 600 ft. each. Three overhead traveling cranes or gantries serve six of these slips. One of these enormous labor-saving devices travels 541 ft., another 629 ft., while the third travels 752 ft. Two of them have spreads of 190 ft., with 86 ft. hoist; the third spreads 176 ft., and has a hoist of 73 ft. The dry dock is 472 ft. long, and the marine railway hauls out vessels of 1,000 tons register. The brass foundry handles manganese bronze as well as brass, and can make a 25-ton casting "as easy as rolling off a log."

The Atlas floating derrick cost \$30,000, more than the entire value of the plant in 1841. It was built in 1892, and has these dimensions: Its pontoon is 73¼ ft. long by 62 ft. wide, with a depth of 13¼ ft. With a maximum load of 125 tons, and water ballast to bring her to an even keel, she displaces 1,563 tons, and has 16 in. of freeboard. Her derrick mast is 116 ft. 7½ in. in height, while the underside of her boom is 65 ft. above the deck. This great derrick lifted the 80-ton boiler of the Minneapolis from the boiler wharf, carried it 100 ft. and placed it in position in the hold of the ship in twenty-seven minutes from the time of hooking on to the slings; and at another time lifted the four boilers of the Indiana, weighing 72 tons each, from the wharf to the hold of the ship in a single afternoon.

The Cramp yard operates largely by compressed air, using, among smaller ones, two compound compressors larger than any others in the world. Seventy-two years ago, William Cramp employed fewer than 100 men; the maximum number employed now is about 8,000 and the payroll from a few hundred dollars a week has grown to \$84,000, an amount reached not very long ago.

During William Cramp's forty-nine years of work in his own yard 207 ships were laid down there. Some of these were famous for their beauty and speed; some were the first of their kind in the United States. The Samson was the first steam tug in this country; the George W. Clyde was the first American vessel fitted with compound engines. The most important naval vessel built at the Cramp yard previous to the revolution in ship building that occurred in the late sixties was the New Ironsides, a cruising ironclad. She was commissioned within eleven months from the signing of the contract, and was of unique design, 250 ft. over all, 58½ ft. beam, with a draught of 16 ft. Her registered tonnage was 3,250. She was ship-rigged, and had engines of 1,800 H.P. She carried sixteen 11-in. Dahlgren guns in broadside, and two 200-

pounder Parrot rifles on pivots, all protected by sloping armor 4 in. thick. She proved impregnable in war, resisting the explosion of a barrel torpedo at Charleston, and passing safely through several actions wherein two of her monitor consorts were sunk; the only injury she suffered in more than twenty battles was the carrying away of a port shutter. She was burned in 1866 while lying in ordinary at the Philadelphia yard.

In the seventy-two years of its existence, the Cramp yard, counting vessels under construction, has built 321 vessels, and 220 engines, ranging from indicated horse powers of 500 and 600 to 23,000, the latter being those designed for the armored cruisers Pennsylvania and Colorado. Of the 321 vessels, twenty-five have been United States steam men-of-war, built at various dates since 1861; one first-class protected cruiser, the Kasagi, for the Japanese navy, four old-type cruisers, one first-class cruiser, the Variag, and one first class battleship, the Retvizan, for the Russian navy; 103 ocean steamers of from 1,000 to 12,500 tons; twenty-six steamers not ocean-going; fifty-four tugs, nine sea-going yachts, twenty-eight clipper ships, and sixty odd other craft for various purposes.

The Cramps have built these vessels now on the navy list of the United States: Baltimore, Yorktown, Vesuvius, Philadelphia, Newark, New York, Columbia, Minneapolis, Indiana, Massachusetts, Brooklyn, Iowa, Alabama, Maine, Colorado and Pennsylvania; the last three not yet completed. During the civil war they built the New Ironsides, the Wyalusing, the Yazoo, and the Chattanooga, besides four transports. Jay Gould's famous yacht Atalanta came from the Cramp yard, while many of the best known merchant vessels sailing from this port were built there. William Cramp died in 1879; but some years previous to his death he had incorporated his firm, changing the name from William Cramp & Sons to the William Cramp & Sons Ship & Engine Building Co., which is the present name of the concern.

DESIGNS FOR NEW BRITISH CRUISERS.

Glasgow, July 29.—The new designs and amended specifications for the six new cruisers of the Devonshire class, ordered some months ago, are now completed, and they will be issued to the contractors for the former designs. The vessels were originally to have 4-in. broadside armor, as in the case of the vessels of the County class, but experiments having proved that this is inadequate to keep out explosive shells when fitted with caps and fired with high initial velocity, attainable even with the 6-in. quick-firing gun, it was decided to make a change and fit 6-in. armor on the broadsides. The decision was also arrived at to fit one-fifth of the boiler power in the form of cylindrical boilers, and the remainder of water-tube boilers, which required more room than with a complete installation of tubulous steam generators. These changes necessitated a longer and broader hull, so as to keep the draught within reasonable limits, even for the increased displacement of vessels authorized in the spring of last year. It is nearly three months since the order was placed upon the original design, but the improvements now being made justify the delay.

It is in contemplation to fit the second-class cruisers with the water-tube boiler designed by Mr. James Weir of Cathcart, Glasgow. This boiler includes in its advantages a combustion chamber and tubes expanded in the ordinary way, and several members of the navy boiler committee visited the Cathcart works and inspected the boiler there used. It had been running practically continuously for two years, and tests showed that when forced it could burn over 60 lbs. of coal per square foot of grate per hour, and yet give an efficiency of between 67 and 68 per cent., while under natural draft it consumed 29 to 30 lbs. per square ft. of grate with an efficiency of about 75 per cent. Under the former conditions the evaporation was over 9 lbs. of water from and at 212° F. per pound of coal, and under natural draft 10½ lbs. of water from and at 212° F. Following upon the inspection of the boiler Messrs. Weir, on the invitation of the authorities, submitted designs for the boiler installation for a second-class cruiser of 10,000 I.H.P., with 2-in. tubes of lap-welded wrought iron. The firm not only guaranteed the evaporation, but also absence from corrosion, provided their arrangements for supplying water to the boilers were carried out. The boiler committee, however, hesitate over the use of double-ended boilers of large size.

A NEW CARGO RECORD.

With increased draught of water throughout the lake system, as is usual about the middle of the season, the big ore carriers are all increasing their cargoes. The tow barge John Smeaton of the Steel Corporation has established a new cargo record. She has just delivered at South Chicago from Two Harbors a cargo of 7,536 gross tons or 8,441 net tons. This includes, of course, the 1 per cent. in excess of bill of lading weight which the ship carries on account of moisture in the ore. Cargo records corrected to date are:

Iron ore—Steel tow barge John Smeaton, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,536 gross or 8,441 net tons, Two Harbors to South Chicago; steamer William Edenborn, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,446 gross or 8,339 net tons, Two Harbors to Conneaut.

Grain—Steamer Simon J. Murphy, Eddy Bros. of Bay City, 269,000 bushels of corn, equal to 7,532 net tons, South Chicago to Buffalo; steamer Douglas Houghton, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 308,000 bushels of clipped oats and 60,000 bushels of corn, equal to 7,520 net tons, Manitowoc to Buffalo.

Coal—Steamer I. L. Elwood, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,688 net tons anthracite, Buffalo to Duluth; steamer I. L. Elwood, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,388 net tons of bituminous, Cleveland to Duluth.

It is now certain that owners of sufficient stock of the Republic Iron Co. to constitute a control have consented to a transfer of the stock to the Cambria Steel Co. at \$15 a share. It is understood that the steel company will be satisfied with a controlling interest. Some of the holders, while disposing of part of their stock in order to give the steel company control, have also decided to hold part in the belief that with a definite market for the ore the stock will be of greater value later on.

The submarine torpedo boat Grampus was successfully launched at the works of the Union Iron Works, San Francisco, this week.

COST AND MAINTENANCE OF CHICAGO BRIDGES.

A controversy between City Engineer Ericson of Chicago and the Scherzer Rolling Lift Bridge Co. over bridge matters in Chicago, not only brings out some very instructive facts regarding the cost and maintenance of bridges, but is also liable to develop investigation on this score that will prove of interest throughout the country, as Chicago needs many new bridges and will soon take another lead in that regard. The Chicago Daily News of recent date contained the following item:

"City Engineer Ericson is indignant at the charges made by President Scherzer of the Scherzer Rolling Lift Bridge Co. concerning the cause of the condition of the Van Buren street bridge. He ascribes Mr. Scherzer's statements to chagrin over the failure of the manufacturer to get contracts for city bridges and over the refusal of the city to pay the \$18,000 to \$20,000 royalty on each Scherzer structure. Mr. Scherzer blames the city for the delay in getting the Van Buren street bridge back into running order. In this bridge the electric armature burned out and it has been found necessary to telegraph to the Westinghouse Co. of Pittsburg for new ones. They could be made in Chicago, Mr. Ericson said, but for the fact that the law requires all purchases of over \$500 to be made under contract after advertisement and bidding. 'Mr. Scherzer is wild because the city and others are not using his type of bridge,' Mr. Ericson said. 'The sanitary district uses it and has already paid \$100,000 in royalties. We will not pay such royalties and that is where the shoe pinches.'"

Of course this criticism from the Chicago engineer has not gone unanswered by the Scherzer company. In a letter to the Construction News under date of July 25, Mr. Albert H. Scherzer says:

"The published report of the department of public works of the city of Chicago for the year 1900, division of bridges and viaducts, page 88, contains the following statements: 'In 1899 this division made a critical analysis of the literature on movable bridges built in the United States and Europe, with the view of selecting a type of bridge suitable to the requirements of the Chicago river and its branches. The results of this analysis were put in the form of a report showing the advantages and disadvantages of the various movable bridges in use. The type known as the trunnion bascule bridge was considered to be the one that could most fully and satisfactorily meet Chicago requirements, both from a scientific as well as a practical and economical point of view. This type was then discussed in detail and three complete designs were made, differing in appearance, method of mounting, etc., but all involving the main feature—that of revolving on a fixed trunnion.'"

"About the time of the publication and circulation of this report and from time to time since then statements have appeared in the daily papers of Chicago, emanating from the engineering department of the city, intending to discredit the Scherzer rolling lift bridges in use, coupled with statements that the Scherzer Rolling Lift Bridge Co. demanded \$18,000 as royalty on each bridge. Recently, upon the completion of the Clybourn place trunnion bascule bridge, the following information was furnished by the engineering department of the city and appeared in the public press of Chicago: 'The improvement cost the city \$155,000, of which \$69,000 was for the foundation. For once in the city's history there was no bill for extras. Other bridges will be built of the same type. Commissioner of Public Works McGann and City Engineer Ericson several years ago determined that the city should not pay the \$18,000 royalty required for the use of the Scherzer patent on each bridge. They went deeply into bridge plans and had new designs drawn up. The result is the present pattern, which is held to be the cheapest obtainable, according to the city officials. The new bridge is similar to the tower bridge of London.'"

"We are forced to answer these statements, as they have been widely circulated at Chicago and copied in the newspapers of other cities. These statements are unfair to us, damaging to our business and misleading to the public, because they create the impression that the taxpayers of Chicago will save money by the use of the Ericson trunnion bascule bridge; while the fact is that this type of bascule bridge costs more than twice as much as a Scherzer rolling lift bridge of equal size and capacity. The statement that we charge \$18,000 for the use of the Scherzer patents on each bridge is untrue. We have never asked for or received such a sum of money for royalty. The money which we ask for and receive from our patrons consists largely of compensation for actual work and responsibility assumed by our company. The work consists of preparing and furnishing the designs, plans and specifications in detail, checking all the shop plans and supervising the construction of the bridges. We assume the further responsibility of furnishing large bonds, guaranteeing the successful operation of our bridges when completed. We also furnish bonds guaranteeing against the infringement of patents. This engineering work compels us to employ a large number of expert bridge engineers of the highest class for more than a year for each bridge. We also require the use of considerable capital for bonds and business expenses. What the above services cost the city of Chicago for the Ericson Clybourn place trunnion bascule bridge and for the other Ericson bridges under construction and proposed to be built is not stated.

"The Scherzer rolling lift bridge was invented, patented and used nearly ten years ago, because the trunnion type of bascule bridge was inadequate to meet the requirements of the Metropolitan Elevated railroad of Chicago. The Scherzer rolling lift bridge is more modern, scientific, economical and practical than the trunnion bascule bridge, and more large Scherzer rolling lift bridges have already been built than of all other types of bascule bridges combined.

"The trunnion bascule bridge is not the most scientific and practical movable bridge. The reasons are so numerous that we can mention only a few of them. Fundamentally the great sliding friction of the trunnions of the trunnion bascule bridge is unscientific as compared with the virtual absence of friction of the large rollers of the Scherzer rolling lift or bascule bridge. This is especially valuable in a movable bridge because of the large masses or weight to be supported and rapidly moved. The trunnion bascule bridge does not move back from the waterway when it is opened. It therefore requires a longer span than the Scherzer rolling lift bridge in order to provide an equal width of clear channel for navigation. The Scherzer bridge provides the maximum width of clear channel for navigation with the shortest possible span because the Scherzer rolling lift bridge moves back and away from the channel when it is opened. This advantage of the Scherzer bridge has a large economical and practical as well as scientific value over the trunnion bascule bridge. Every foot saved by a reduction of span of a movable bridge means a large saving in structural steel, counterweight, machinery, operating equipment and substructure,

and consequently in the cost of the bridge. Because the Clybourn place bridge is a trunnion bascule bridge it requires a movable span 18 ft. longer than a Scherzer bridge, giving the same width of clear channel. This advantage of the Scherzer bridge alone would save more than \$25,000 on the cost of the Clybourn place trunnion bridge. The Clybourn place trunnion bridge is a through bridge and has large, deep and very expensive counterweight pits in the substructure. A through Scherzer rolling lift bridge would not require any counterweight pits whatever and the substructure is comparatively small as shown by the design of the much larger Scherzer bridge under construction at the mouth of Newton channel, New York city, and by a large number of other through Scherzer bridges. In the description of the Clybourn place trunnion bridge attention is called to a very small by-pass under each tail pit, designed to provide additional water-flow. Scherzer bridges, whenever desired, have been and are built to provide a very much larger water-flow, as has been done in many cases and is illustrated in the design for the Newton channel bridge, without the special and expensive construction of by-passes used at the Clybourn place trunnion bridge.

"All Scherzer rolling lift bridges have been and are being constructed more economically than the Clybourn place trunnion bridge. We mention only a few which were contracted for in the same city, under the same market conditions, over the same river, with the same bridge company as contractor for construction as the Clybourn place trunnion bridge. The Scherzer bridge across the Chicago river at Main street gives the same width of roadway and sidewalks as the Clybourn place trunnion bridge, but it provides a clear channel for navigation 140 ft. wide, while the Clybourn place trunnion bridge provides a clear channel for navigation only 100 ft. wide, a very material difference in a movable bridge. Yet the bids received for the construction of this much larger Scherzer bridge amounted to \$120,388, while the bids received under the same market conditions for the construction of the Clybourn place bridge amounted to \$147,486. Had the clear waterway provided by the Clybourn place trunnion bridge been as wide as that provided by the Scherzer bridge at Main street, namely, 140 ft. wide, instead of 100 ft. wide, the proportionate additional cost would have been at least \$100,000 more, making the cost of the trunnion bridge for a 140-ft. channel at least \$250,000. Had the Main street Scherzer bridge been a through bridge similar to the Clybourn place bridge, instead of an arched deck bridge, which design was demanded by the Municipal Art League of Chicago for artistic reasons, then there would have been a saving on the Main street bridge of at least \$17,000, making the total cost of a through Scherzer bridge providing a clear channel of 140 ft., and giving the same width of roadway and sidewalks as the Clybourn place bridge, \$103,000, which would show a saving in cost of construction of \$147,000, in favor of the Scherzer bridge.

"The State street bridge, the most important highway bridge at Chicago, is being built under the plans of the Scherzer Rolling Lift Bridge Co. This bridge is also an arched deck structure, this form being also selected for artistic reasons. It has wider roadways and sidewalks than the Clybourn place bridge and it also provides a clear channel for navigation 140 ft. wide in place of only 100 ft. provided by the Clybourn place trunnion bridge. The masonry of the substructure extends 7 ft. deeper than the masonry of the Clybourn place trunnion bridge, to provide for a 30-ft. depth of water, while the Clybourn place trunnion bridge provides only a 21-ft. depth of water. Yet this much larger, more important and prominent Scherzer bridge cost less than the Clybourn place trunnion bridge.

"Highway Scherzer rolling lift bridges constructed, under construction, and contracted for in Chicago, at North Halsted street, Taylor street, Canal street, Eighteenth street, Polk street and Harrison street, in addition to the railroad bridges at Chicago used by the Metropolitan Elevated Railroad, Chicago Terminal Transfer Railroad, Baltimore & Ohio Railroad, Chicago & Great Western Railroad, Pittsburg, Cincinnati, Chicago & St. Louis Railroad and the Chicago Junction Railroad, and numerous other railroad and highway bridges elsewhere, further substantiate the very great economy, practicability and scientific value of the Scherzer rolling lift bridges over the trunnion type of bascule bridge.

"As a further proof that the Scherzer rolling lift bridge is more scientific, economical and practical than the trunnion bascule bridge, we offer to furnish two Scherzer bridges of the size and capacity of the Clybourn place trunnion bascule bridge for the cost of that one bridge, or one Scherzer bridge for one-half of the cost of the Clybourn place trunnion bascule bridge, and will guarantee that any of these Scherzer bridges will operate more rapidly and with less power than the Clybourn place trunnion bridge. We will furnish simultaneously with the receipt of the order and the signing of the contract by a responsible party, an amount of money in bonds equal to the cost of the Scherzer bridges ordered, to be held as a guarantee for the faithful fulfillment of our contract. We will be glad to receive any number of orders on this basis at any time.

"Two additional trunnion bascule bridges, according to the plans of the city engineer of Chicago, similar to the Clybourn place trunnion bridge, but even more costly, have been under construction for several years by the city administration and others are proposed to be built. At least one-half of the money being expended for the construction of trunnion bascule bridges could be saved to the city of Chicago if Scherzer bridges were allowed to be used by the present city engineer, as has been done by former city engineers, and as has been done and is being done by the sanitary district of Chicago at some of the most important streets crossing the Chicago river; also by the city of New York, city of Buffalo, city of Cleveland, and other cities and large railroad companies too numerous to mention here.

"The three Scherzer bridges, now in charge of the city engineer of Chicago at Van Buren street, Taylor street and North Halsted street, are poorly maintained. The public is barred from the use of these bridges for weeks at a time, while the Metropolitan Elevated railroad has carried more than 1,200 trains every day since its completion, more than seven years ago, and has never delayed a train on account of any fault of the bridge, as stated by the general manager and confirmed by the president of the Metropolitan Elevated Railroad Co. Equally good records have been made by all other Scherzer bridges, excepting only those under the control of the present city engineer of Chicago. The fact that the present city engineer of Chicago is personally interested in the design of a trunnion bascule bridge disqualifies him to decide upon and act impartially in these matters for the best interests of the city of Chicago. It is not strange that there is a lack of funds to maintain existing bridges at Chi-

cago when public funds are lavishly wasted in the building of new bridges in order to favor the design of the city engineer."

In a later communication (July 28) intended to refute misleading statements alleged to have been made by the city engineer, Mr. Scherzer says:

"If Mr. Ericson makes the statement that we charge \$18,000 to \$20,000 royalty for each Scherzer bridge, he is deceiving the public. Our charges are for actual engineering services and responsibilities assumed by our company, which compel us to employ a large number of expert engineers of the highest class for more than a year for each bridge. We also furnish large bonds, guaranteeing the successful operation of our bridges when completed, and also guarantee against the infringement of patents. If Mr. Ericson insinuates that he is saving the city money by building Ericson bridges instead of Scherzer bridges, he is even more boldly deceiving the public. The contract price for the Main street Scherzer bridge was \$120,388, while the contract for the Clybourn place Ericson bridge was \$27,000 higher, although the waterway provided by the Ericson bridge is only 100 ft. wide, while the Scherzer bridge at Main street provides a clear waterway for navigation 140 ft. wide. If a Scherzer bridge had been built at Clybourn place instead of the Ericson bridge, at least \$70,000 would have been saved to the city of Chicago. Mr. Ericson wasted all of this public money to build a monument to his name at Clybourn place. It is evident that the three additional bridge monuments which he is now building to his name at Ninety-fifth street and East and West Division streets will each be equally or even more expensive to the taxpayers of Chicago."

BUFFALO ELEVATOR AFFAIRS.

A correspondent at Buffalo who keeps about as well in touch with grain elevator matters as it is possible under the conditions of newspaper work sends the Review a communication supplemental to the very interesting history of Buffalo elevator business that appeared in our issue of July 24. He says:

"An article in the Review of July 24 is very comprehensive so far as regards the history of our harbor elevator rates. It does not deal, however, with the influence upon the situation that has of late been exercised by shippers who own or control certain of our elevators. This influence has now brought about a new revolution in the business, close upon the others that have so vexed the port of Buffalo of late.

"The first of these upsets of former conditions was the shutting out of the no-track elevators, called canal houses, on account of their being confined to that route for an eastern outlet. As a rule these elevators were smaller than the others and stood for a period that has entirely passed into history, except that the canal is still with us, waiting to be given a new lease of life by enlargement. If this measure should be put through, as we look for it to be, the canal elevator would return to use, unless the larger track houses should continue the fight against them by still elevating canal grain free, as has been done for some seasons.

"When the railroads, led by the New York Central, the largest single interest in elevator matters here, refused to take the canal houses into the pool any longer, there were still a number of houses that had no direct rail backing, all of the roads being satisfied with their own elevators without them. For a time there was less dissension than formerly, as there were fewer owners to claim two or three times the percentages that they were entitled to. Soon the rail domination became so complete that the unattached houses submitted to the division without much more than a protest. 'We take what they give us,' was the favorite comment. The pool came easy for awhile, but it was a very weak affair for all that.

"The reason for it at first was that the roads were known to be about as willing to drop the pool and absorb the elevation rate as to keep up an organization. Afterwards the shipper element came in and the pool was weaker than ever, for the shippers would not accept a minor percentage. At the most it was a matter of general accommodation with them more than anything else to combine, as all they wished to do was to handle their own grain through their own houses. They did not care to go into the general elevator business to any extent.

"The unattached elevators that feel themselves just as good as a rail house are the Export, owned by Armour & Co. and Bartlett, Frasier & Co. of Chicago; the Electric, controlled by Kneeland & Co. of New York; and the Marine, controlled by Hancock & Co. of Philadelphia. It matters very little to these shippers whether they are in a pool or not and they will not be dictated to by the roads, which are really too much their servants to desire such a course. But when these two classes of interests choose to pull together they can easily manage to do as they like, so the owner who was a mere warehouseman, with neither shipper nor railroad behind him, was more dependent than ever on the will of the majority, and as he was getting so very little out of the late apportionment he at last thought he would pull out and see if a little side irritation would have any effect.

"Nobody seems to think that the eight seceding houses have any real strength, still the pool of the Class A houses, as the railroad and shipper combine are called, are apparently disposed to deal with the eight seceders, or Class B, and an informal offer of a certain percentage in a lump, for them to squabble over, appears to have been made, though there is no report of it having been acted on.

"Then comes the defection of the Great Northern, without which no pool could develop any strength, so long as the Great Northern is sure of a good rail connection east. The report that the roads will not carry its grain at regular rates is made and denied. What is really developing is that there are now too many elements in the business more or less indifferent to a pool to make it possible to re-establish a really strong one again. The canal elevators, now all idle for years, have one hope in canal enlargement, the warehouse section must get rail or shipping support or go to the wall, and the existing houses, if wood, are all in a bad way, on account of the competition of the steel ones—the Great Northern, Electric, Eastern and Dakota. Again there is a movement on the part of the roads to establish themselves on the lake front, and that will tend to cheapen all houses, elevators or anything else, located on the inner harbor.

"Buffalo as a port is looking to a future that is likely to eclipse her former history very far, but changes must be many to adapt it to new requirements and these changes respect neither the individual nor his property. Grain will be handled for very little hereafter, whoever does it, and we believe the state will not be foolish enough to throw away her natural advantages, of which Buffalo is always the key.

"It is true that the proud elevator system of a few years ago, too strong

for its own good—as this leadership blinded it to coming difficulties—has been swept away, but the port can handle more grain today and handle it cheaper and faster and store it safer than ever before. What we want is a better outlet to the seaboard, one that shall regulate all charges and insure prompt movement of all freight. That problem is not so nearly solved, so far as the transportation public is concerned, as the elevator problem is, for that is a matter of individual ups and downs."

The foregoing was submitted to one of the few representatives of vessel interests in Buffalo who are fully acquainted with the elevator situation. He said:

"There is some truth but also some conjecture, wide of the mark, in what your correspondent has to say. I refer particularly to the elevator side of the matter. The real truth is that the difficulty at present is due to the building of two new steel elevators at Buffalo, one of which, the Eastern, was finished last fall, and the other, the Dakota, this spring. The additional sharing had to be found for them, and as the elevators are shared on a percentage plan, that involved some one giving up some of the percentage he had been enjoying. A fair way would perhaps have been to have prorated the new amount off everybody else, but some, especially the Great Northern, would not have it that way. Consequently the association was extended from week to week until, on July 10, some of the elevators, about eight of them, formed an organization of their own. Soon after there was an organization of the remaining elevators formed under the old name, from which the Great Northern has now separated. Against the organization known as the Elevator Owners of Buffalo, and against the Great Northern, the railroads have taken the stand that they will not give the usual payment for elevating out of the 'at and east' rate, which means in plain English that the elevators so treated cannot make any money out of through business. This is the same position that the railroads took in the Kellogg matter, and they were successful in beating him, because he brought a conspiracy suit and could not prove his case. If he had brought a plain suit for discrimination there would have been a different ending. The whole matter at present turns on whether the railroads can say to any elevators or group of elevators 'you must take such and such a percentage,' and force them to take it by rate manipulation. If they can do this, then there is no use holding meetings of owners at Buffalo. The whole matter can be fixed up in New York by the trunk line managers and ended. If they cannot do this, then the elevator men themselves can fix up their differences in a few minutes, as there would be no ground for railroad elevators demanding a lion's share of the money. Your correspondent says there is doubt as to the position the roads have taken in the matter of rates. There is absolutely no doubt. They have refused to pay the ½ cent elevator charge to both the Elevator Owners of Buffalo and the Great Northern."

INDORSES THE SHIPPING BILL.

The annual report of the collector of the port of Baltimore is interesting for the observations which he makes. He shows that the total value of exports for the fiscal year were \$80,503,075, being a decrease of \$25,658,317 or nearly 25 per cent. The decrease is largely in corn of which 40,000,000 bushels were exported in 1901 and only 4,000,000 bushels in 1902. Iron and steel exports from the port also decreased 60 per cent. The collector's observations are as follows:

"The foreign tonnage movement at this port shows a falling off as compared with last year. This, however, in view of the general depression of the foreign carrying trade, was not unexpected, due largely to the shortage of our cereal crops. The coastwise trade shows an increase. There are now thirteen established lines of steamships trading at this port, representing 110 vessels, with an aggregate net register tonnage of 331,695 tons and an estimated carrying capacity of 497,542 tons cargo. There were built and documented in this collection district during the year eighteen steam and sail vessels, aggregating a gross tonnage of 21,007 tons and valued at \$1,992,400. At the yards of the Maryland Steel Co. two mammoth 11,000-ton steel steamships for the Atlantic Transport Co. are on the ways.

"Our ship building interests have been quite active, and a number of vessels of the larger types have been built, the most notable of which were the Shawmut and the Tremont, both steel steamships, at Sparrows' Point for the Boston Steamship Co., registering 9,600 tons each. The outlook for this branch of our industry, I regret to say, is not so bright, owing to the failure in its passage by congress of the pending shipping bill. How it is possible for our ship yards to compete with the subsidized merchant marine of Europe passes my comprehension, and these subventions are being increased yearly. I learn that England will this year increase her already large subsidies by \$2,500,000 and guarantee a 2½ per cent additional on the capital invested.

"The German government guarantees the North German Lloyd 7 per cent interest on its capital stock; the French government guarantees 12 per cent; Japan, 13 per cent; Austria, 37c per ton, and the Netherlands, no longer able to hold out, will this year subsidize its steamships to the extent of 3 per cent of the capital invested. And yet the congress of the United States hesitates in coming to the relief of our merchant marine. The policy of government aid, like that of tariff, offers a fruitful field for discussion, and I am willing to go on record as predicting that what the protective policy of this government has done in the way of encouraging the marvelous development of the industries of this country the provisions of the pending shipping bill will do for our merchant marine. I am in favor of carrying our own products in ships built in American yards and named by American men."

According to a London dispatch the Allans and the Elder-Dempster Steamship Co. have jointly tendered for the proposed fast Atlantic service between Canada and Great Britain. The Canadian Pacific railway's offer would entail an outlay of \$25,000,000, each passenger steamer costing \$4,000,000. The freight vessels would cost, on an average, \$900,000 each. Insurance circles regard the proposal to make Quebec the summer port as a mistake, owing to the dangers encountered in navigating the St. Lawrence river. They think that the year round the Halifax service would have every chance of success.

The ten Spanish vessels sunk in Manila bay by Admiral Dewey are to be raised and sold as junk.

SHIP BUILDING AT PHILADELPHIA AND VICINITY.

Philadelphia, Aug. 4.—Chief Gunner Charles Morgan, United States navy, who gained fame by diving exploits about the ill-fated battleship Maine in Havana harbor, at present stationed on the cruiser Minneapolis at League Island navy yard, has originated an idea which, if it meets his expectations, bids fair to revolutionize torpedo boat construction. Expressed in a word, Gunner Morgan's hope is to build a torpedo boat with a fin-keel instead of the regulation straight keel. The advantages he claims for it are many. In the government's service Gunner Morgan has been actively connected with nearly all the torpedo boats and his invention is the outcome of experience and close observation of the short-comings of the little fighting craft. The present torpedo boats, with few exceptions, have difficulty in maintaining highest speeds—say 25 to 26 knots and over. They reach that limit only by use of best Pocahontas coal and under forced draft. Gunner Morgan hopes to have his boat make 30 knots under natural conditions, and with ordinary fuel. His idea of the fin-keel, while not a new one, has never been applied to torpedo boats or destroyers, or in fact any steam-driven craft. Racing yachts with fin-keels apparently gain speed, and Gunner Morgan's plan is to apply the same idea to the small fighting vessels. To keep "head-down" and avoid the "water-drag" in the wake when speeding, all torpedo boats have eight to ten tons of lead in the bow. Gunner Morgan's boat will maintain even keel under any speed and he thus does away with the dead weight. He also says his boat, steadied by the fin-keel, will be able to turn in her own length and get away after attacking an enemy in many minutes less than the present boats, which at best run in a wide circle when turning. Gunner Morgan is building a model 4 ft. over all, which will be ready for trial in the Delaware off League island about Sept. 1. Gunner Clark, also of the Minneapolis, is building the engines for the tiny craft. The model is expected to make 10 knots. If this is accomplished Mr. Morgan is sure that with a boat of regulation size he can bring out 30 knots easily. If the model makes 11 knots he counts on 31 knots for a big boat; if 12 knots, 32.

The new steel tug boat Astral, built at Dialogue's ship yard for the Standard Oil Co., was launched last week. She is one of the largest and most powerful sea-going tugs ever built on the Delaware.

The torpedo boat destroyer Barry, built by the Neafie & Levy Co., will have her trial trip over the Barren island course in the Chesapeake this week.

Cutting steamboats in half and lengthening them is becoming almost a separate industry in Delaware river ship yards. The Clyde liner Apache, which has had a 52-ft. section inserted amidship, will be followed in the dry dock at Cramps by a sister ship, the Araphoe, for a similar lengthening. The steamer Parthian of the Boston & Philadelphia line has just been withdrawn from service to go on the ways at the Harlan & Hollingsworth yard, Wilmington, to be lengthened 40 ft.

NAVY DEPARTMENT FULL OF APPREHENSION.

Secretary of the Navy Moody has gone on his vacation and has left the navy department in a state of nervous apprehension as to what he intends to do next. The impression prevails that Mr. Moody entered the navy department with certain preconceived ideas regarding it which he had gathered at long range. In short the navy department believes that his general view of the navy was unfavorable. An examination of Mr. Moody's utterances in the house are not as bad as those which have been credited to him, but nevertheless they are not altogether favorable to the navy. Mr. Moody's general idea was that the navy was a fighting machine and that it should not do civilian work. He was opposed to the navy department doing the hydrographic work. He also thought that the proper place for a naval officer was afloat and not ashore. The New York Sun, which has investigated the subject, says upon this point:

"Like many congressmen, he was evidently of the opinion that there were too many officers on shore. If he came into the department with the opinion that shore details were merely intended to give pleasant berths to those who wanted to shirk sea duty he soon changed it. He has said on several occasions that he believed that naval officers generally were as conscientious and willing a set of men as there was in the world. He has said also that he believed that a certain amount of shore duty was necessary to the proper education of an officer, and that the naval man who spent all his time at sea was almost as much handicapped in performing his work officially as the naval man who spent all his time on shore. But despite these opinions, Mr. Moody felt that he had to meet the problem confronting him by getting more officers for sea service. He found, perhaps to his surprise, that of the one thousand-odd members of the sea-going branches, 70 per cent. were on ships in commission. This left him only nominally 300 officers from whom to choose, but actually a much smaller number. Even to a man of the most radical views in opposition to permitting sea-going officers to remain on shore, it would be obvious that there were certain shore duties of a military character which could be performed only by men who understood ships. When those of command rank for whom there are no sea commands are subtracted the number available is still further reduced. Mr. Moody set about meeting the problem by a policy of consolidating duties. Whenever he found two officers performing shore work which he believed one of them could do just as well, he ordered the other to sea. But the results of this attempt at obtaining relief were too meager to amount to anything. Besides, he was warned that there was danger in making one man do the work of two. While the warnings made him go more slowly, he didn't give up trying. He tried a more conservative way of finding out just who could be spared from shore details.

"Relying on the sense of honor prevailing among naval officers, he put a number of questions to those ashore to ascertain whether it was really necessary to the good of the service that they should remain there. All the answers were returned promptly and have been taken away by the secretary to read and consider during his vacation. Nearly every officer questioned was of the opinion that his shore work was necessary to secure the efficiency of the fleet. To one question of Mr. Moody's some of them said that while they believed their duties could be performed by civilians, no civilians of sufficient technical knowledge could be secured for the salaries paid naval officers. It is yet too early for the secretary to reach any general conclusions as to the showing made in these responses, but, certainly, he was not impressed with some of them.

He showed clearly, before he left Washington, that he still clung to the idea that civilians were capable of doing the shore work of some naval officers, and there is every reason to believe that he will try to restrict the shore assignment of officers to duties purely naval, filling the other places, if he can, with men in the civil establishment. In his efforts to carry out a policy of consolidation ashore, Mr. Moody called some of his bureau chiefs into consultation on a suggestion that the inspectors of ordnance and the inspectors of equipment for battleships and other vessels under construction at private ship yards, be ordered to sea and their duties be performed by the naval constructors at these yards. In this suggestion he was supported by the chiefs of the bureaus of navigation and construction and opposed by the chiefs of the equipment and ordnance bureaus. Out of the debate on this subject in the secretary's office some naval officers expect a revival of the bad feeling that existed at one time in the board on construction, known also as the board of bureau chiefs. The result of the discussion was a decision by Mr. Moody to try this feature of his consolidation plan as an experiment at the Bath Iron Works, and if the experiment should prove successful to detach all ordnance and equipment inspectors and send them to sea. From these and other indications it is evident that until congress affords greater relief than was given by the creation of ninety-five new cadetships, the sea-going naval officers must expect to have very little shore duty. As for most of the officers of the line below command rank—that is, lieutenant-commanders, lieutenants, junior lieutenants and ensigns—it is doubtful if they will have any shore assignments at all until the present situation, as Mr. Moody views it, has been relieved. And this gives a social and personal aspect to the matter, involving wives, mothers and sweethearts, the first of whom will be 'navy widows' more than ever. For those officers who are unmarried, the prospect of a long period of bachelorhood confronts them. Mr. Moody is a bachelor."

Mr. Moody's attitude upon the subject of naval increase is one of doubt. He has said to some of his bureau chiefs that unless congress provided more officers he would feel himself obliged to oppose the building of more ships. He is opposed to the building of war ships in navy yards and intends to keep a strict record of cost of the one which is to be built in the New York navy yard. Another point of interest is touched upon by the Sun as follows:

"One matter of great interest to naval officers just now is whether Mr. Moody will be secretary of the navy in fact as well as in name. Consideration of this question involves, in the minds of officers, the character of his relations with the bureau of navigation. With many the belief is prevalent that this important bureau has nearly always dominated the head of the department. Its powers are very great and are curtailed only so far as the secretary chooses to exercise supervision. The bureau is the executive office of the department in the secretary's control of ships, officers and men. All orders to officers are transmitted through it. It practically holds in its hands the fate of every officer in the service below flag rank. It may give an officer an assignment that will afford him opportunity to distinguish himself, or it may place him where, figuratively, he may never be heard of again. To naval officers, the advent of a new chief of the navigation bureau is more important than the installation of a new secretary. No wonder then that the appointment of Rear Admiral Henry C. Taylor as the bureau's chief was regarded with the greatest interest throughout the service. Secretary Moody and Admiral Taylor entered the department practically at the same time. Admiral Taylor assumed his new duties on April 29 last; Mr. Moody was sworn in three days later. New to the business, Mr. Moody was obliged to depend for advice and guidance on Admiral Taylor, his principal executive officer. Now that the secretary is getting the hang of things, to what extent, naval officers ask, will he be influenced by the views of the navigation bureau's chief? It is acknowledged generally in the service that Admiral Taylor is a very able man, whose personality is bound to impress every one with whom he comes in contact. Nobody will blame Admiral Taylor if he endeavors to get the secretary to carry out his ideas as to how the military part of the service should be conducted, but the commissioned personnel is anxiously awaiting some development to indicate whether Mr. Moody will follow Admiral Taylor's advice in all things of this character or adopt policies of his own. So far there has been nothing to show what may be expected of the secretary. In a recommendation of the navigation bureau that was not adopted by the secretary some officers thought they detected a scheme to prevent any other bureau of the department from having direct intercourse with the secretary. Mr. Moody did not pass on the recommendation until he had consulted the heads of other bureaus and their opposition to being obliged to conduct their business with the secretary through the assistant secretary as had been suggested caused him to veto the proposal.

"As for Admiral Taylor it should be said that he is regarded as a conscientious, hard-working officer, full of pride in the service, and anxious to bring it to an even greater state of efficiency. He has never been accused of having ambitions that contemplated anything except the good of the navy. Although, as was said in the beginning, naval officers have not formed a judgment of the new secretary, it should be understood that certain opinions are prevalent that give a hint of what may be expected unless Mr. Moody on his return to official duties more clearly defines that he believes the personnel to be hard-working and conscientious. If there is any opinion which more than any other appears to be forming among naval officers, it is that Mr. Moody is suspicious of them and their purposes. Such an opinion, once formed, may cause endless trouble and be a serious impediment to maintaining the efficiency of the service."

The whaleback steamer Thomas Wilson, which went down near the entrance to Duluth harbor in collision lately, will be sold to the highest bidder on Aug. 15. An advertisement to this effect appears elsewhere in this issue. It is estimated that the steamer will be worth a considerable sum of money after she is raised—at least sufficient to make her a merchantable object. The bodies of the nine men who were drowned are still in her, all attempts to remove them having failed.

Capt. H. W. Baker of Detroit has taken a contract to raise and deliver at dry dock the wooden steamer City of Cleveland, sunk off Fitz William island, at the entrance of Georgian bay, Sept. 16, 1901. The steamer was owned by M. A. Bradley of Cleveland, for whom the wrecking will be done. Capt. Baker's wrecking tug J. W. Snook is being fitted out for the job.

CREATING A SENTIMENT FOR A GREATER NAVY.

The real significance of the remarkable activity exhibited just now by the naval administration, and the uncommon publicity that is given to the plans for the maneuvers a few weeks hence and for the unprecedented mobilization of force in the Caribbean sea next January, is causing no end of speculation among officers ashore and afloat, and the conclusion is being pretty generally reached that the purpose is to convince congress at its next session of the extreme urgency for most liberal provision for the national defense, and particularly for a vast increase of naval strength, commensurate with the enlarged responsibilities growing out of the necessity for protecting outlying possessions, controlling the isthmian canal and commanding respect for the Monroe doctrine. The great object lessons it is proposed to impress on the country have been devised by the general board, which has quickly attained preponderant influence since Secretary Moody entered the cabinet, and promises to develop into a full fledged general staff before the end of the year. With Admiral Dewey at its head, and most of the fighting officers of the service, including the personnel of the war college, supporting it, this organization is dominated by Rear Admiral Taylor, chief of the bureau of navigation, whose control of the navy is comparable only with that exerted by Gen. Corbin over the army. Admiral Taylor is recognized as easily the leading theorist of the service, the officer who built up the war college to be a model for all nations, the highest type of the "scholar" in strategics, and more respected by progressive American officers than even Mahan is abroad. His studies of today's international problems and his deductions as to the lines along which the United States must be ready to act in the near future have had extraordinary weight with both arms of the United States service, and he has come to have the distinction of being honored as a "prophet" on international possibilities.

According to officers who are closest to him, he is thoroughly alive to the steady set of a current which is carrying the United States and Germany along converging lines in many parts of the globe, and bringing these two nations into closer rivalry everywhere. So far as that goes commercially, it is not a brand new discovery, but to Admiral Taylor belongs the exclusive credit of warning the leaders of the army and navy that preparations must begin at once and be vigorously prosecuted from this time forth for a grave crisis in German-American relations in the spring of 1907. It is interesting to note that the admiral's predictions of a conflict are so adjusted as to permit his taking part in its settlement. He is due to retire at about the same time that the threatened war with Germany, according to his notions, is to break out.

The frequent suggestions of trouble with Germany have not attracted much attention, coming from youthful and enthusiastic officers, with their careers before them, who have talked about the likelihood of trouble for several years past, but the conclusions of a "mature scholar," who will reach the retiring age on March 4, 1907, and who fixes the time of the crisis within a fraction of a year, have naturally produced some effect, especially when he is satisfied that the immediate locality of the storm center will be in the Caribbean Sea. The process by which this prediction has been developed by a "thoughtful scholar" is not wholly disclosed, but it undoubtedly involves the completion of the current construction program of Germany late in 1906, which will make that country's navy much stronger than ours at the rate we are now building. In fact, the time will be coincident with the most efficient sea power Germany now contemplates—the time when the Panama canal will be occupying much attention in this country, when the Cuban republic may have about reached the end of its tether, when Jamaica and other West Indian islands will be prostrate in bankruptcy, when the Netherlands—and this is one of the admiral's pet predictions, it is said—will have been absorbed by Germany, leaving Curacao and the other Dutch islands of the Caribbean sea as bones of contention to force a supreme test of the Monroe doctrine, not to speak of the ripeness of the season for plucking a few South American republics for repudiated debts and damage claims.

Neither Admiral Taylor nor Admiral Dewey and the other members of the general board really expect a war with Germany, but they foresee that all the conditions which lead to wars are likely to be brought about at some time or other, and they are strong in their belief that the best, if not the only, way to avert war is to be so thoroughly prepared for it and have your possible enemy so fully informed of your strength as to deter a provocation. Of the sincerity of German friendship for the United States and of Germany's formal assurance of respect for the Monroe doctrine Admiral Taylor does not harbor a doubt, but neither he nor those who follow his lead in the great problems of modern political development care to close their eyes to what they regard as the irresistible and incontrovertible trend of events, nor feign

insensibility to what they believe to be the unmistakable certainties of the future.

From this point of view the coming maneuvers take on new and important interest. Their main purpose is to accentuate before the world the ability of the United States to defend itself, first, in demonstrating by the summer evolutions that ample protection has already been afforded to the metropolis and no concern need be felt by the nation over a naval attack by any European power; and, second, through the winter mobilization convincing continental countries that this government can assemble and maintain in the American Mediterranean a force that a navy possessing no established bases in that region would not lightly dare to tackle.

Not a bit of doubt as to the outcome of the sea attack on New York is felt by the promoters of the great war game. The navy expects to be defeated. Its force of ships will be as great as it is conceivable that any European power, save England, perhaps, could send across the ocean to operate far from a source of supplies against our coast. By the resort to all the highest naval strategy and with exhaustive knowledge of European resources, the fleet under Admiral Higginson will closely simulate the best offensive squadron any country except England, and possibly France, could today send against New York without leaving the home seas defenceless. It is a foregone conclusion that such a squadron would not dare to attack the southern entrance to New York, and that it would have a practically hopeless mission in attempting to force its way past the forts near New London. The first part of the program of demonstration to the world is, therefore, negative to the extent that it only shows that in case of war the fighting battleships of the navy will not have to be drawn away from their real work to defend the harbors on the coast, but will be free to seek the enemy on the high seas.

Infinitely more impressive is to be the great gathering of the North and South Atlantic and European squadrons under the admiral and five rear admirals at Culebra next January, when more than a \$1,000,000 for extraordinary expenses above the mere maintenance of the service will be used.

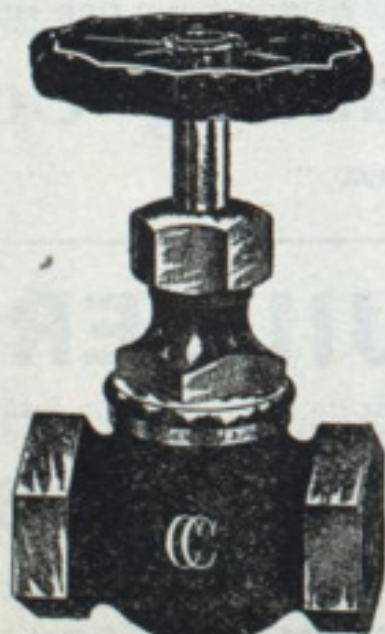
PNEUMATIC TOOLS IN EUROPE.

Mr. J. P. O'Donnell, head of the International Pneumatic Tool Co., Ltd., of London, is in America arranging the final details of the transfer of that company to the Chicago Pneumatic Tool Co. Taking over this company gives the Chicago Pneumatic Tool Co. control of the pneumatic tool trade throughout Europe. They will now consolidate the factory of the International Pneumatic Tool Co. with their plant already started in London and are sending men from their staff in America to take charge of the office and factories in London.

The Chicago company have been compelled to operate two of their factories in America extra time, working at night, and this addition to their London plant will give them a much needed increase in manufacturing facilities and give them also control of the pneumatic tool business there. Mr. J. W. Duntley, president of the Chicago company, will sail for London Aug. 12 to make arrangements for vigorously pushing the trade in Great Britain and on the European continent.

At the present time the Chicago Pneumatic Tool Co. has a force of experts in Glasgow giving an exhibition of ship riveting and ship construction with pneumatic tools under the auspices of the Glasgow Federation of Ship Builders. The English and Scotch builders are just waking up to the imperative necessity of the use of pneumatic tools in ship work, and it is anticipated that practically all of the yards on the Clyde will very shortly be equipped with these tools.

Capt. William Cumming died at his home in Lakewood near Cleveland, a few days ago. He was one of the best known vessel masters on the great lakes and had sailed practically since boyhood. He was sixty-one years old at the time of his death. For a great many years Capt. Cumming was in the employ of M. A. Hanna & Co. He sailed the first steel steamer that was built by that firm. This was the steamer Cambria, which came out in 1887. The following year he brought out the steamer Corsica and sailed her until 1896 when he took command of the steamer Coralia. He was in the Coralia when she passed, with all the other Hanna vessels, to the United States Steel Corporation, and continued in the service of the Steel Corporation until last fall when he was taken ill and had to leave his ship. Last spring he was appointed master of the steamer William F. Fitch of the Franklin Transportation Co., of which Dan R. Hanna is president. He went to Detroit to superintend the work of fitting her out but was compelled to relinquish this labor owing to failing health. On his return home he resigned command of the Fitch and since that time failed steadily until he passed away.



No. 4.

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THESE VALVES ARE HEAVIER THAN THE "STANDARD" AND ARE MADE OF CRANE HARD METAL, WHICH IS NEARLY AS HARD AS STEEL AND WEARS LONGER THAN ANY OTHER BRONZE COMPOSITION KNOWN. THEY ALSO HAVE A CONICAL SEAT, WHICH SOME ENGINEERS PREFER. ARE EXTENSIVELY USED AND HAVE GIVEN EXCELLENT SATISFACTION.

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NAVAL NOTES.

The cruiser Des Moines will be launched at the Fore River yard at Quincy, Mass., on Sept. 20. Her sponsor will be Miss Helen West, daughter of Harrie West, a business man of Des Moines. Miss West was selected for this honor by the people of Des Moines.

The official trial of the new battleship Maine has been postponed from Aug. 18 until Sept. 1, as her builders desire to place her in dry-dock on Aug. 25 for the purpose of cleaning her bottom. The state of the tide will not be right for docking purposes until the 25th.

The board of construction of the navy department had a meeting last week and decided on the general plans for the two new gunboats authorized by the last naval appropriation act. They will follow closely the Marietta type. The displacement will be 1,050 tons, as against 1,000 in the case of the Marietta, and this probably will decrease the speed with the same horse power, 1,000 in each case, from 13 knots to approximately 12½. The batteries will be identical with those of the Marietta and the Wheeling—six 4-in. guns, four 6-pounders and two 1-pounders. There will be some minor changes in the internal arrangements of boilers, etc., but the principal change will be an additional foot of freeboard and an overhanging stem, which, it is believed, will keep the ship somewhat dryer.

Capt. Lemly, judge advocate general of the navy, has just summed up in tabular form the results of the first complete year's work of the probation system put into effect by him for the treatment of naval prisoners. The results are exceedingly gratifying to the officials of the department, for they indicate that about half of the men sentenced by courts martial for naval offences will reform if they have a chance under this system. It is shown that there were twenty men on probation on July 1, 1901. In the year following thirty-two sailors were so placed on probation. Of these seventeen were unconditionally restored to good standing in the service. Only four deserted, while five failed to reform and were required to serve out their sentences. One was honorably discharged, and three were discharged as undesirable,

leaving twenty men on probation at the beginning of the present fiscal year.

Referring to recent reports regarding a reorganization of finances of the American Ship Building Co. (consolidated lake yards), President W. L. Brown of that company says that he is not aware that any change is to be made in the company's capitalization, either by an increase or decrease in the stock, or that an issuance of bonds is probable. Mr. Brown says recent buying of the common stock is simply on merit. Earnings are large and plants are filled for a year ahead. Asked about the possibility of an early disbursement on the common shares, he said: "That matter will be discussed at the annual meeting in October. If I knew it would not be for me to say what will be done."

Cabins and ..Staterooms

of modern vessels especially those in the passenger service should demonstrate the supreme possibilities of the wood finisher's art.

This demands a special varnish however, as atmospheric conditions are more destructive to varnish afloat than ashore and the ordinary article is of but little use.

The varnish best adapted to withstand the deleterious influences of wind, wave and weather is "BERRY BROTHERS' SPAR VARNISH."

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OPEN-HEARTH STEEL CASTINGS
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80,000 POUNDS WEIGHT.

MACHINE WORK AND PATTERNS
FURNISHED WHEN REQUIRED.

RAIL OR WATER DELIVERIES.

CAPACITY, 1500 TONS PER MONTH

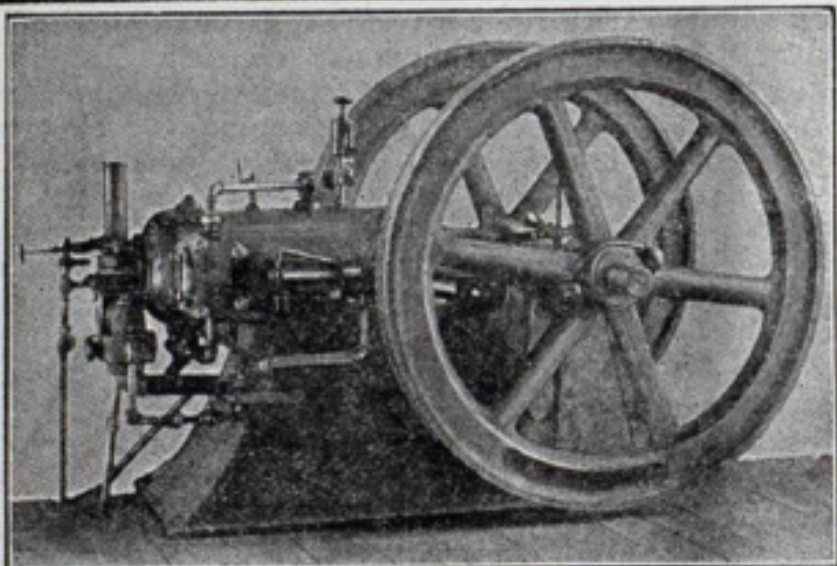
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SMOOTH-ON IRON CEMENTS

We have many
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April 26, 1901.
To Whom It May
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We have used Smooth-On Iron Cement for leaks and fractures on Water Jackets of Gas Engines with satisfactory results. We find it an economical way of making a durable repair.
Hudson County Gas Co.
P. S. Young, Secretary.



The Smooth-On Iron and Steel Cements are dry metallic compositions—which, when mixed with water, become a hard metallic iron that is insoluble in Steam, Water, Petroleum or other oils—that will withstand an intense heat, and, the expansion and contraction being the same as iron, is why they are sometimes called Magic Iron. When applied to a blemish in a casting by a skilled mechanic the blemish is removed. Unequalled for boiler patching and stopping blowholes in iron or steel castings; when metalized, Smooth-On is the color of cast iron and as hard. Write for our 60-page illustrated book telling all about the different Smooth-On Cements; it is free.

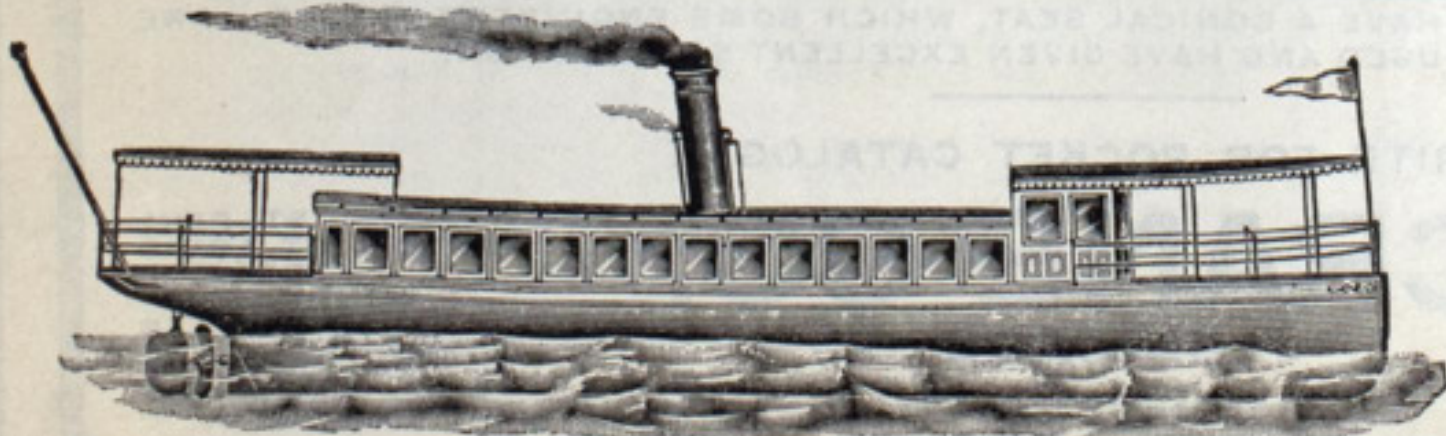
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MARINE IRON WORKS,

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Our exclusive specialty is designing and building (to order) complete outfits of genuine MARINE machinery in small and medium sizes (4 to 30 inch cylinders).

HIGH PRESSURE—COMPOUND—TRIPLE EXPANSION
and PADDLE WHEEL OUTFITS.

EITHER WOOD OR COAL-BURNING MARINE BOILERS.

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The Only Marine Directory

The Marine Review publishes annually the Blue Book of American Shipping

THE ONLY MARINE DIRECTORY IN THE UNITED STATES



THIS directory is now in its seventh year and has increased steadily in patronage and in strength. Every bit of statistical information of a maritime character which is collected during the year in this office finds its way into the Blue Book.

Every ship builder, marine engine and boiler builder, ship owner, naval architect, marine engineer, and, in fact, everyone whose business is with ships is mentioned in the Blue Book and his address given. The aim has been to make it a complete working directory of the marine trade of the United States. With its aid you may reach anyone connected with this great branch of industry.

Its statistics of waterborne commerce are thoroughly reliable. The section devoted to the commerce of the great lakes with its iron mines and their output, its coal trade and dock facilities, its grain trade and elevators, its ships and their owners, is very thorough and absolutely authentic.

The rear pages of the Blue Book are devoted to a **BUYERS' DIRECTORY** of the **MARINE TRADE**—that is a list of manufacturers of ship yard equipment and ship supplies, arranged under the titles of the articles which they make, for the benefit of the buyer, who is usually the ship builder or ship owner.

The Blue Book enjoys an extended patronage throughout the United States and Canada and a considerable favor in Great Britain and Europe. We, therefore, commend it as a medium where-with to reach the foreign field.

The 1902 Blue Book is now being distributed. If you would like to know more about it, a postal card will fetch a little booklet.

MARINE REVIEW PUBLISHING CO.
39-40-41 Wade Bldg., Cleveland, Ohio

AN OCEAN POST OFFICE.

As a result of the development of wireless telegraphy an ocean post office has been established about 110 miles west of the Lizard. The vessel will be situated right in the fairway of the channel with a vertical electric beam illuminating the clouds, so that she can be picked up at night at a distance of 60 miles. She will be fitted with powerful searchlights, so that signals may be read and answered almost as easily at night as by day and she will also carry powerful automatic fog signal. Her system of wireless telegraphy is guaranteed to be effective up to a distance of 195 miles. The great advantage of this floating postal and telegraph station is that it will enable vessels to obtain their orders without entering port and thus avoid pilotage and port dues. Then as a reporting station which may be approached in any state of the weather, for the purpose of transmitting important information, the value of the floating post cannot be overestimated.

General Superintendent of Ship Building.

Position wanted by engineer and naval architect who has been general superintendent of two of the largest yards of the country engaged on merchant work. Experienced also in construction of naval vessels. Address Box 31, the Marine Review Pub. Co., Cleveland, O. Aug. 14

Schooner For Sale.

FOR SALE—Schooner Helvetia, capacity 1,000,000 ft. of lumber or 1,500 tons of ore. Inquire of H. J. Johnson, 1015 Society for Savings, Cleveland, O. tf

For Sale.

Cabin gasoline launch, 40 ft., 16 H.P. Almost new, excellent condition, fully equipped. Reasonable price. Geo. L. Fleitz, Detroit, Mich. Aug. 7

For Sale.

The undersigned will offer for sale the wreck of the whaleback Steamer Thomas Wilson of Duluth, sunk in collision June 7, 1902, in Lake Superior $\frac{7}{8}$ of a mile E. by N. $\frac{1}{2}$ N. from the Duluth piers. The Wilson was loaded with about 3,000 tons of iron ore and lies in about 75 ft. of water. The vessel was built in 1892 and was classed A 1. She is 308 ft. in length, 38 ft. beam, with a gross tonnage of 1,713 tons.

Sealed bids for the purchase of the Wilson will be received by the undersigned up to Aug. 15, 1902, reserving the right to reject all bids if unsatisfactory. Terms cash. The Pittsburg Steamship Company, A. B. Wolvin, General Manager, Duluth, Minn. Aug. 7

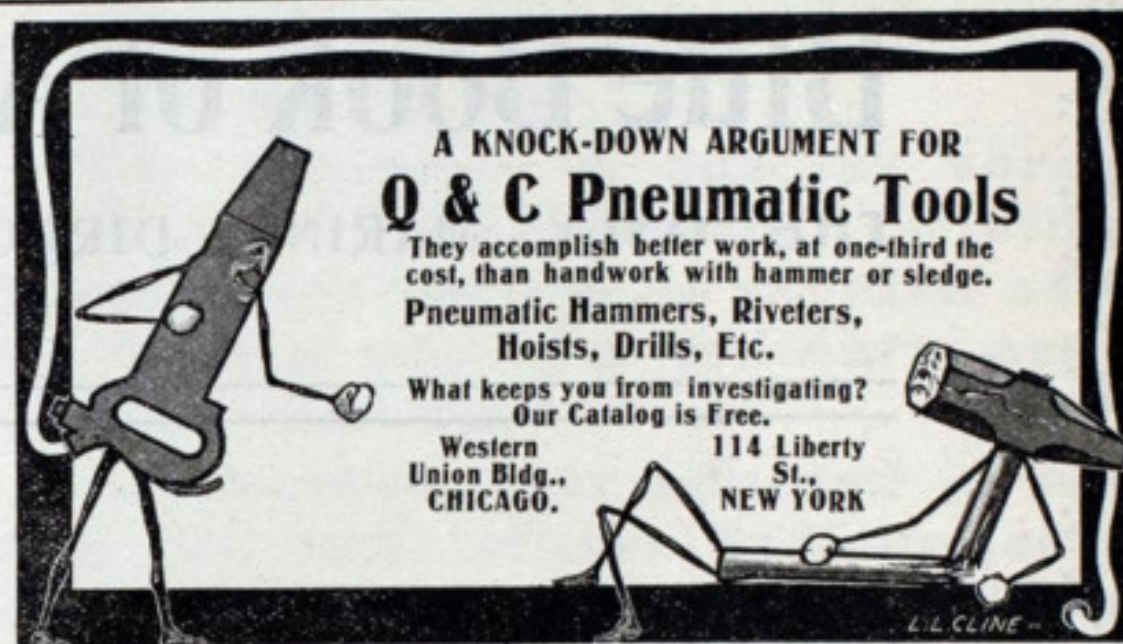
Position Wanted by Marine Engineer.

Marine engineer, technical education, shop and marine experience, at present in charge of engine department with large concern in middle west, desires a change. Member A. S. M. E.; age 40; married. Address Box 30, the Marine Review Pub. Co., Wade building, Cleveland. Aug. 7.

Proposals for the Improvement and Enlarging of Cleveland Harbor, Ohio: U. S. Engineer Office, No. 185 Euclid Ave., July 28th, 1902. Sealed proposals for the improvement and enlargement of Cleveland Harbor, Ohio, by extending the main breakwater eastward will be received at this office until 2 p. m. August 28th, 1902, and then publicly opened. Specifications, blank forms and all available information will be furnished on application to this office. MAJOR DAN C. KINGMAN, Corps of Engineers, U. S. A. Aug. 21

U. S. Engineer Office, Buffalo, N. Y., July 26, 1902. Sealed proposals for dredging and construction work at Erie Harbor, Pa., will be received here until 11 a. m., August 15, 1902, and then opened. Information on application. T. W. SYMONS, Major, Corps of Engineers. Aug. 7

U. S. Engineer Office, Buffalo, N. Y., July 23, 1902. Sealed proposals for hire of dredging plant for excavation in Niagara River and Tonawanda Harbor will be received here until 11 a. m., August 22, 1902, and then opened. Information on application. T. W. SYMONS, Major, Corps of Engineers. Aug. 14.



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Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890.....	67,728	2,460										
1891.....	68,247	68,331	204									
1892.....	68,247	68,403	69,822	23,259								
1893.....	68,379	68,343	68,286	68,247								
1894.....	68,439	68,367	68,574	68,439	37,701							
1895.....	68,673	68,766	68,739	68,808	40,887	28,713						
1896.....	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897.....	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898.....	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899.....	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900.....	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
1901.....	44,220	69,627	69,594	66,948	51,057	62,460	62,490	61,743	62,688	43,866	62,466	63,126
Total.....	801,723	783,264	714,378	664,371	438,576	418,836	355,173	271,257	234,870	172,596	148,416	115,266

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